

PERCEPTIONS AND EXPERIENCES OF CAMPUS CLIMATE OF LATINO/A
STUDENTS WHO ARE STEM MAJORS

THESIS

Presented to the Graduate Council of
Texas State University-San Marcos
in Partial Fulfillment
of the Requirements

for the Degree

Master of ARTS

by

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San Marcos, Texas
December 2011

PERCEPTIONS AND EXPERIENCES OF CAMPUS CLIMATE OF LATINO/A
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DEDICAITON

To my parents.

ACKNOWLEDGMENTS

First I would like to thank all my classmates for the lively discussions. I would also like to thank my thesis committee, Dr. Martinez-Ramos, Dr. Sorto, and Dr. Anderson for your guidance and support throughout this whole process.

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ABSTRACT

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Ten Latino/a students were interviewed about their experiences studying a STEM subject at Texas State University-San Marcos. The purpose was to ascertain what motivates students to study STEM subjects, what their experiences studying STEM subjects at Texas State is like, and if there were any differences between the responses given by men and women regarding their experiences. The study found that students often went through an adjustment phase which could result in a drop in grades or change in major or program. Students were motivated by a sense of identity arrived at through participation in student organizations. Finally, there were differences in the experiences of men and women, some women going so far as stating that although their gender has presented

challenges, particularly as a result of how they are viewed as women and as scientists, that ethnicity presented little to none of these sorts of challenges in comparison.

CHAPTER I

INTRODUCTION

The formal presentation of this paper is that of a qualitative research project. Informally, I sought to construct a counter-narrative to those presented at any typical hierarchical institution, broadly speaking and specifically, those of Texas State University-San Marcos. Yet it is not from a cynical disposition towards deconstruction that I chose this approach. Rather, my aims throughout this process have always been entirely progressive in the sense that the ultimate goal is change.

The necessity of this type of research originates in the prevailing winds of society whose epitome and purest form of expression can be observed in the ideas associated with recent trends. For example, trade agreements like the North American Free Trade agreement (NAFTA) have displaced countless of people (Gerson et al. 2004). In the U.S., the result is a growing Latino population alongside increasing xenophobia and reaction against the ideals of multiculturalism and diversity. This reaction is evidenced in the rise of organizations such as the minutemen, state legislation such as SB1070 in Arizona, and here in Texas, the advent of The Former Majority Association for Equality, a non-profit organization that awards scholarships to white men only.

This is the broader context from which this research project emerged. It seeks to examine the relationship between Latino students studying STEM subjects and society in general, in essence, the way that individuals interact with institutional and cultural forces.

However, it is also a social critique, implicitly advocating social transformation, the nature of which, although not made explicit, can by necessity only be described as radical.

On the issue of identity, I do not engage it as an end in itself, but as a form of praxis. Yet, this point may be relevant only insofar as this paper is reflexive. Indeed, my focus has always been on both, my own identity as a Latino and those of the students I interviewed. Needless to say, these two did not always concur. For example, many students saw STEM fields not only as lucrative economically, but also as inherently worthwhile endeavors. One student even disclosed to me an entire philosophical world view based on the ideas of Charles Darwin. Instead, I hold the view that social progress has always lagged behind scientific progress and thus special emphasis must be placed on the former.

But can one make social change through writing a thesis? I am not particularly inclined to believe this. However, by contributing in some way to the knowledge of Latinos in STEM fields, I am hopeful that I am presenting an alternative vision, and thus planting a seed that may one day bloom.

CHAPTER II

LITERATURE REVIEW

Background

Is there an education crisis in the United States? Empirical research on higher education seems to suggest a resounding yes. The United States is falling behind other developed countries in the proportion of 25 to 34 year olds with college degrees (Dowd, Malcom and Bensimon 2009). One aspect of this crisis centers on the low proportion of Latinos entering higher education. The importance of education for Latinos lies not only in American goals of geopolitical competitiveness, but also in lowering the achievement gap, which is characteristically ethnic and racial in nature.

The Latino population in the United States is one of the fastest growing demographics. Between 2000 and 2010, the percentage of the Latino population grew from 12.5% to 16.3% (US Census 2010). Unfortunately, educational attainment for this group is not keeping up with population growth. Between 2007 and 2008, the percentage of Bachelor's degrees awarded to Latinos was only 7.9% (National Center for Education Statistics [NCES] 2009a). Social scientists and educators must seek to understand why Bachelor's degree attainment for Latinos is so low. Furthermore, researchers need to explore not only why more Latinos are not entering college, but also why many are not finishing once they do enter. Without ignoring the implications of the former, the

purpose of this research will nonetheless place as a central area of concern the problems Latinos in STEM majors face once they enter college.

The issue of underrepresentation of Latinos in academia becomes especially pronounced when focusing on STEM fields. These areas of study tend to show even less participation by Latinos, and especially Latinas. For example, for the years 2007 to 2008, in the biological and biomedical sciences, only 5,180 Bachelor's degrees were awarded to Latinos, out of 77,854 (NCES 2010). That's only 6.7% of biological and biomedical degrees conferred. The figures for engineering Bachelor's are not much better. Out of 68,676 Bachelor's degrees awarded in Engineering, a mere 4,419 went to Latinos (NCES 2010). That comes out to 6.4% of all Engineering degrees conferred, a percentage not only lower than the overall Latino population, but also disproportionate with the numbers of Latino college enrollment.

When looking at gender, the numbers are even more off balance. In Engineering only 968 Bachelor's were awarded to Latinas (NCES 2010). In the biological and biomedical sciences, the number of Latinas awarded Bachelor's degrees was actually higher than Latinos (3,149 for women compared to 2,031 for men) (NCES 2010). However, it should be noted that as the level of degree increases, the representation of women decreases. Statistics indicate that in 2008, 50.7% of Bachelor's degrees in the sciences and engineering fields went to women. At the Master's level, only 45.7% of those degrees awarded went to women, and at the Doctorate level, women represented only 39.5% of degree recipients (U.S. Census Bureau 2011). It is likely that the number of Latinas at these levels of degree attainment either resembles the overall population of enrolled women, or is much lower.

Studying Latinos in STEM fields is important since they are a growing population in both academia and the nation in general. As such they are an underdeveloped recruitment pool for potential human capital in STEM fields. While advancing Latino STEM participation will better position the U.S. in terms of global economic competitiveness, it also presents opportunities for advancing Latinos' social position within the nation. For example, science and engineering jobs tend to pay on average higher salaries than other fields (National Science Board 2010), providing Latinos with greater access to resources for individual and community betterment.

Terminology

I use the term Latino to describe a person of any gender who traces their ancestry to a country or countries in Latin America through at least one parent. Although the term Latino is technically sex neutral (Hayes-Bautista and Chapa 1987), on occasion I will use the term Latina or Latino/a where I feel doing otherwise would make the language ambiguous.

Part of this study deals with the effects of Hispanic Serving Institutions (HSIs) on the academic experiences, perceptions and pathways of Latino students studying STEM subjects. The U.S. Department of Education (2011) defines an HSI as an institution of higher learning with at least 25% Latino/a full time undergraduate students. I employ this definition for the purpose of this study.

Theoretical Perspective

As a theoretical point of reference, Hurtado et al.'s (1998) campus climate framework is useful for studying Latino students in STEM majors. This approach looks at

college campuses from four different dimensions, each of which contributes to the overall climate of race and ethnic interrelations at institutions. The four dimensions are the institution's historical legacy of inclusion, the structural diversity of the institution, the psychological climate for students at the institution, and the behavioral climate. The historical legacy pertains to an institution's past practices in terms of inclusion and exclusion, and how these past practices have shaped present day ones. Structural diversity corresponds to the racial and ethnic makeup of the campus. Psychological climate refers to the individuals' view of group dynamics. Finally, the behavioral climate corresponds to what people actually do at the campus. These four dimensions combined constitute the campus climate, and are seen as contributing factors in the academic success of minority students (Hurtado et al. 1998).

This study will focus on Hurtado et al's (1998) psychological dimension of the campus climate framework since analysis will pivot around students' perceptions of campus climate. There are four aspects of the psychological dimension of campus climate, three which deal with perceptions and one which deals with attitudes, but all of which are in one way or another focused on the issue of diversity. I chose to divide the four aspects of the psychological dimension into two separate spheres: perceptions of diversity related issues and experiences with diversity. I found this approach most suitable given the data. This will provide a glimpse into the social and cultural context that shapes the learning experiences of Latino students at a four-year non-Hispanic majority HSI.

In other studies of HSIs (Godoy 2010), students reported (corresponding to each of the four aspects of the psychological dimension of campus climate) the value of

relationships with other groups, expressed participating in institutionally sponsored diversity activities as well as spontaneous ones, did not perceive discrimination based on race or ethnicity, and showed positive attitudes towards members of other groups. Godoy's (2010) primary method of data collection involved small focus groups of less than four people, a limitation addressed in that study by individual interviews. In contrast, my study focuses on Latino student experiences employing one to one interviews as the method for primary data collection. Finally, Godoy's (2010) focus groups and interviews were done at two Hispanic majority HSIs. One aspect of this study attempts to ascertain if similar attitudes exist in non-Hispanic majority HSIs.

Finally, this paper expands on Hurtado et al.'s (1998) campus climate framework to include gender. Typically, campus climate is used to determine specific relations between members of different racial or ethnic makeup as positive or negative. It is important, however, to ascertain the campus climate as it relates to gender as well. As this research shows, many Latinas face challenges as both ethnic minorities and as women. Thus, campus climate must include the perceptions and attitudes, behaviors, institutional practices, structural makeup and historical legacy of an institution as it pertains to women.

Mechanisms of Learning

The basis of any sociology of education is to discover effective pedagogies, but it is understood that these will be inextricably linked to larger social forces and struggles. In this sense, one could argue that the broader campus climate of an institution has direct and definite, indeed measurable, repercussions. As an example of this, Cole and Espinoza's (2008) study suggests that a positive campus climate leads to cultural

congruity, which results in higher GPA's for Latinos in STEM. Cultural congruity, as defined by Cole and Espinoza (2008), include the "student's level of interracial interactions, comfort and compatibility" (p. 289). Cole and Espinoza (2008) also employ Hurtado et al. (1998) to construct the conceptual basis for campus climate. The data was culled from the Cooperative Institutional Research Program (CIRP) at the Higher Educational Research Center at the University of California, Los Angeles (Cole and Espinoza 2008). Cole and Espinoza (2008) challenge certain assumptions about cultural congruity by showing how certain aspects of it, such as studying with others and attending diversity functions, corresponded to lower GPA levels in their sample. However, another finding of this study showed that faculty support and encouragement was positively correlated with GPA. This latter aspect of campus climate leads to higher levels of cultural congruity, which result in better academic performance (Cole and Espinoza 2008).

Mestre 's (1981) research on bilingual students is important as many Latino students speak both Spanish and English. This study attempted to ascertain the predictive validity of a number of mathematics and language variables on GPA and mathematics performance, measured by proficiency on standardized tests such as the Scholastic Aptitude Test (SAT) and the Test of Reading (TOR) to name just two . Based on the assumption that academic success can accurately be statistically predicted for a population, Mestre (1981) found GPA to be highly correlated with these variables but only among bilingual students. Mestre's (1981) sample consisted of Hispanic bilingual STEM majors and monolingual STEM majors. Findings showed that the GPA of the bilingual group more strongly correlated with the language proficiency tests than with the

monolingual groups, although not the SAT-SV (Mestre 1981). Math proficiency tests also correlated with language proficiency among the bilingual group, but not the monolingual one (Mestre 1981). Because some standardized tests, particularly the SAT, do not correlate well with GPA, and the implications of the connection of language proficiency and math proficiency, Mestre (1981) suggests that the SAT and class ranking not be the only criteria for college admission.

One important aspect of learning is identity formation, while another is participation. Using various sociocultural theories of learning, as well as theories of mathematics learning, Oppland (2005) explores how and why some students succeed in an Emerging Scholars Program (ESP) Calculus I workshop. A strength of this study is the variety of sources of data, such as interviews, reflection papers, and classroom observations among others (Oppland 2005). However, Oppland's (2005) sample was limited to 11 Latino undergraduate students, while the analysis revolved around two case studies, one male student and one female student. Oppland (2005) uses a narrow lens to create a model of success specific to these two students. For the female student, gender and racial/cultural experiences played an important role in developing a positive shift towards mathematics identity (those beliefs that individuals hold about their mathematics performance abilities), while class identity was positively participated in, however produced no shift (Oppland 2005). For the male student, class did play a role in a positive shift towards mathematics identity; however gender did not (Oppland 2005). Oppland (2005) concludes that incorporating complex identity constructions (race, gender, class) into their Calculus workshop helped the students succeed.

While Oppland (2005) shows how mathematics learning shapes identity and participation, psychological barriers to achievement may exist as well. Goldwaser (2008) developed a Spanish language version of the mathematics anxiety rating scale - short version (MARS-SV) to test the effects of mathematics anxiety on Spanish bilingual students. Goldwaser (2008) was able to observe a relationship among the sample with MARS-SV scores and avoidance of mathematics intensive majors. However, Goldwaser (2008) did not observe the same effect when looking at the number of courses taken and mathematics anxiety. There was also no effect observed between mathematics anxiety and mathematics performance (Goldwaser 2008). Goldwaser (2008) suggests that mathematics anxiety does not significantly influence mathematics performance, however, it does influence choice about majoring in a mathematics intensive major. However, these results may be relevant only to the sample that was observed. The students that Goldwaser (2008) studied were primarily high achieving students, creating the possibility that these students were equipped with more effective coping techniques than other high mathematics anxiety students.

Espinoza (2008) studied a very specific subset of the Latino STEM population. Specifically, the study sample was composed of eight first generation Latino STEM students (Espinoza 2008). All participants were engineering majors who were interviewed for the study (Espinoza 2008). Although participants felt positive about their experiences at the university and the overall campus climate, they were at the same time conscious of being underrepresented. However, within the engineering department, racial and socioeconomic disparities were not salient (Espinoza 2008). Of note is students' attitude of professors, whom comprise a great part of the latticework that supports the

institutional structure. Participants were concerned that many professors were more interested in research than teaching, although positive experiences with professors were recorded as well (Espinoza 2008). The aforementioned study points to the importance that professors play on the self-efficacy of first generation students.

Hispanic Serving Institutions

For the 2010-2011 academic year, the Hispanic Association of Colleges and Universities identified 311 HSIs, the majority of which are in California, Texas and Puerto Rico ("2010-11 Hispanic Serving Institutions." 2011). These institutions include two- and four-year colleges as well as public and private ones. With a few exceptions, HSIs do not have an institutional mission to serve Latinos. Rather, HSIs are defined by the percentage of Latino undergraduate enrollment (Santiago 2006). In this respect they are different than other Minority Serving Institutions (MSI's) like Historically Black Colleges and Universities (HBCU's) and Tribal Colleges and Universities (TCU's) which require specific missions to serve their respective populations (Santiago 2006). Because of the growing Latino population and the way that HSIs are designated, it is likely that HSIs will continue to grow in numbers.

While the majority of HSIs are community colleges, in 2003-04 about 47% of all HSIs were baccalaureate-granting institutions (Santiago 2006). Still, that same year, that number represented only 2% of all four-year institutions in the U.S. (Santiago 2006). In spite of this, 40% of all baccalaureate degrees earned by Latinos were awarded by HSIs (Santiago 2006). The importance of doing diversity research on and at HSIs becomes obvious. Even though they represent only a small portion of institutions in the country,

they enroll and graduate a significant portion of the Latino population. Furthermore, as Santiago (2006) indicates, HSIs tend to have very diverse student populations, which have implications for other people of color as well.

Some research on HSIs attempt to focus on the demographic makeup of the campus. Such research, such as Crisp, Nora, and Taggart's (2009) study of an HSI student population, reveals interesting comparisons between Latino and Anglo students. Overall, Latinos had lower first semester GPA's as well as lower SAT scores (Crisp et al. 2009). The two groups also varied in that Latinos were awarded proportionally more Pell grants, more were first generation students, and more were going to school part time (Crisp et al. 2009). When comparing Anglo and Latino students within STEM fields, the study showed similar patterns, except that there was no difference in high school percentile and first semester GPA (Crisp et al. 2009). However, the particular HSI that Crisp et al. (2009) studied seemed to be well suited to produce STEM bachelor's degrees among Latinos. Indeed, Latinos were 1.37 times more likely to declare a STEM major than white students (Crisp et al. 2009). But the question arises: how do HSIs work to offer this advantage?

Institutional pathways play a crucial role in the attainment of STEM degrees for Latinos. Using cumulative advantage and disadvantage theory, Malcom (2008) attempts to explore the processes that perpetuate inequalities among Latinos holding STEM degrees. Findings showed that Latino STEM degree holders who first received an associate's degree were more likely to end up in a non-research HSI (Malcom 2008). These students were also more likely to be first generation college students, as well as non-traditional students (Malcom 2008). What the study shows is that HSIs can have

disadvantages for students that may be offset by certain advantages. For example, Latinos at HSIs tended to major in non-social science STEM courses in higher proportion than at non-HSIs (Malcom 2008). Still, the fewer research opportunities that HSIs tend to offer limit the possibilities of graduate school for many students (Malcom 2008). This indicates why institutional pathways are important. Many, like community colleges and HSIs, can accumulate both advantage and disadvantage.

Using the same data as the previous study, Malcom (2010) made further findings about Latinos in STEM. This study focused specifically on the role of community college in the institutional pathways of Latinos. As it was the same data, expectedly, older, first generation Latino students tend to go through community college at some point in their educational career (Malcom 2010). The percentage of Latino STEM students who had at one point gone to a community college was also substantially high, at 61% (Malcom 2010). Similar to the previous study, Latinos who go through the community college system are more likely to end up at less selective, non research institutions, such as many HSIs, yet a significant portion of Latinos in STEM use this pathway (Malcom 2010).

Further, one could ask how HSIs prepare students for careers in STEM? Using campus climate as a framework, and qualitative data, including interviews and focus groups, Godoy (2010) attempts to answer this question. The students, faculty and staff that Godoy (2010) observed were from the University of Texas at El Paso (UTEP), as well as the Polytechnic University of Puerto Rico (PUPR) (Godoy 2010). Godoy found that Latino STEM students at these two HSIs faced financial challenges as a result of coming from disadvantaged communities (Godoy 2010). Latino STEM students also faced poorer pre-college preparation for STEM, English language difficulties, and in

PUPR, institutional barriers such as lack of parking and student leisure areas (Godoy 2010). HSIs can offer more opportunities for all students through increased funding and grant money, however, Latino students still face challenges and barriers to success at these institutions. Yet, the campus climate is better suited for Latinos and may be more conducive of STEM degree attainment (Godoy 2010).

Still not all HSIs are created equal. Dowd et al. (2009) selected 25 HSIs through regression analysis as “potential exemplars of effective practice in Latino STEM education” (p. 3). When comparing HSIs by employing equity indicators, many differences were discovered. HSIs varied in the proportions of Latinos earning degrees as well as earning STEM degrees (Dowd et al. 2009). The proportion of Latino student population varied as well, including Latinos in STEM (Dowd et al. 2009). Amidst this high variability, Dowd et al. (2009) suggest that equity indicators be used to set performance benchmarks for institutions.

Godoy’s (2010) study is particularly interesting when considered alongside Dowd et al.’s (2009) report on HSIs. Among the 25 universities in Dowd et al.’s (2009) report is the University of Texas at El Paso (UTEP), one of the two case studies Godoy (2010) carried out. Godoy (2010) concludes among other things that the campus climate at UTEP promotes Latino STEM participation. When looking at Dowd et al.’s data, out of 72.90% enrollment of Latinos in STEM subjects, 70.40% received a STEM degree at UTEP. These two studies show empirical relationships between HSIs and Latino participation in STEM disciplines. Godoy’s (2010) use of Hurtado et al.’s (1998) campus climate framework could be interpreted as explaining the high percentage of STEM enrollment and graduation at UTEP. More specifically, Godoy (2010) noticed positive

circumstances for Latinos on all four dimensions of campus climate. Thus the schools had a historical legacy of promoting STEM among Latinos, the institutions were structurally diverse, and there were positive views about diversity on campus as well as positive interactions between different racial/ethnic groups (Godoy 2010).

One difference between the two studies is that Dowd et al. (2009) does not include Puerto Rican institutions in her report. It's worth considering that at PUPR, the Latino student population (Puerto Ricans) was close to 100% (Godoy 2010). Puerto Rico is also not part of mainland United States. For this reason, Dowd et al (2009) omits Puerto Rican institutions. Godoy (2010) disagrees. Godoy (2010) seems to suggest that separating Puerto Rico as a special case HSI is akin to omitting a particular state. There are a wide variety of cultures represented in the U.S., reflecting the heterogeneous nature of the Latino population itself. Godoy (2010) argues that Puerto Rico be included when doing comparative research on HSIs because it is a part of the heterogeneity of Latino culture. This points to a fundamental dilemma of HSI classification. That is, as Dowd et al.'s (2009) high variability data show, not all HSIs result in the same success rates for Latinos and as such, most likely represent differing campus climates.

Godoy (2010) focuses on two majority Hispanic HSIs but recognizes the importance of examining, "the presence and influence of a 'Hispanic campus culture' at other HSIs, with a majority of Hispanic students, as well as HSIs with lower concentration of Hispanics" (p. 152). By exploring the experiences of Latino STEM students at a non-Hispanic majority HSI, this study hopes to shed light on Texas State's "Hispanic Campus Culture", including Latino students' motivations to study a STEM

subject, challenges that they face, and things that led up to their decision to study a STEM subject.

CHAPTER III

METHODOLOGY

For this study, a critical qualitative approach was chosen. The study is qualitative in that no statistical manipulation of observed phenomenon was conducted. Traditional ways of engaging in science, what in sociological terms is generally referred to as positivist, relies on a static, decontextualized object of study. Furthermore, the subject/observer/researcher is implicitly without identity, placing culture, values, and experiences aside while foregrounding logic, reason and rationality within the analytic process. Esterberg (2002) claims that such approaches have met challenges in the social sciences for a number of reasons, among them that human beings reflect on their own behavior and change behavior when observed. Furthermore, Esterberg (2002) writes that human behavior is “context sensitive,” meaning that studying human behavior from inside a lab can yield drastically different results than observing human beings in their natural settings.

Thus, qualitative research serves as a means to engage science with an eye towards these problems. Considering the research questions of this study, qualitative methods appear to be the best approach since participants are afforded the opportunity to express themselves in any manner they wish. In contrast, quantitative methods would reduce participants’ responses to a set of multiple choice questions from which the

respondent cannot veer. This would certainly limit the range of particular responses but also limit the interpretive scope of analysis, something that should be considered when discussing something as complex as personal experiences. That is not to say it doesn't come with its own problems, least of which is the issue of generalizability.

Similar to qualitative methods, critical theory is also a critique against positivism. The main argument of critical theorists is that positivist science compels the researcher to attempt to view phenomena without any assumptions about it. The problem with this approach is that it creates the condition from which the current social system is perpetuated (Agger 1991). As critical theorists tend to see the system as unjust, then this approach is rejected, since there exists an immediate need to change the system. For the critical theorist, social facts are not inevitable constraints as Durkheim argues, but are instead "pieces of history that can be changed" (Aggar 1991:109).

Concurrent with a constant comparative approach (Anselm and Strauss 1998) this study attempts to construct a theory out of empirical data. In the first phase of coding, categories were allowed to emerge without reference to any particular theory. From then, as patterns emerged, I tried to synthesize various aspects of Hurtado et al. (1998) campus climate framework with the patterns that had emerged.

Research Questions

1. How do Latino/a students in STEM majors adjust to academic life?
2. Are there any different experiences between males and females and if so, what are they?

The Data

For this study, 10 Latino/a students were interviewed about their experiences studying a STEM major at Texas State, a non-Hispanic majority HSI. This study was

reviewed and approved by Texas State's Institutional Review Board (IRB# 2011U362). Each interview was tape recorded, then transcribed for analysis. Before each interview, the student signed a consent form (Consent Form see Appendix B), which was stored in a locked cabinet. Each recording was given a code number and I used pseudonyms in place of participants' real name when transcribing. Interviews were conducted on the Texas State campus at various locations. Most were conducted in the LBJ Student Center, on the third floor, where the couches, tables and chairs are located.

Two interviews were conducted in the chemistry building, one in a lab and one in a hallway. One interview was conducted in the Honors building student lounge. Interviews ranged between 13 to 45 minutes. All interviews were conducted between the Spring 2011 semester and the Summer I and II 2011 short semesters. The responses were compared based on several characteristics including gender, major, and experiences with discrimination.

Students were asked some general background questions about major and ethnicity (Interview Instrument see Appendix A). Although these questions were close ended, the student was encouraged to provide as much detail as possible. Thus, a question about nationality of origin could include a short narrative history about the students' parents, giving insight into the student's social and cultural background. Students were then asked questions related specifically to their experiences as Latinos/as within and out of the university setting (Interview Instrument see Appendix A). These questions were developed with the intent to provide empirical qualitative data about Latino students studying STEM, while at the same time focusing on Latino identity and self/other perceptions. Concluding questions were intended to elicit an overall picture of challenges

and successes on the road towards a successful STEM career that the student has had to or is currently experiencing (Interview Instrument see Appendix A).

I found recruitment to be difficult through formal institutional channels. These included fliering (Recruitment Flier see Appendix C) and forwarded emails by organizations to members. All participants were obtained through less formal institutional social networks. In other words, students did not participate in the study when recruitment consisted of requests to the general Latino/a student population. However, when asked individually through the institution's email system, participants were more likely to respond, express interest in the study, and agree to an interview. I found individual participants' emails through various personal and professional contacts that would inform the potential participant about the study, and would either contact me, or provided my contact with email or telephone number. Some students were obtained through snowball sampling, as participants informed their STEM classmates and friends of the study.

Sample

Ten participants were interviewed, six of which were women, and four of which were men. All ten of the participants were of Mexican origin through at least one parent. Six of the participants were either first generation college students or first generation college graduates. All participants were enrolled at Texas State University-San Marcos. The students also represented a wide variety of majors, including three biochemistry majors, two computer science majors, two mathematics majors, one wildlife ecology major, one clinical lab sciences major and one chemistry major (Table 1). This sample represents the diversity of opinions, perceptions and experiences that students expressed throughout the

interviews. All interviews were conducted by me. Some limitations of the sample include that it was a convenient sample that cannot be generalized to reflect the Latino/a college population. This sample is biased in that it represents mostly students willing to undergo a one-on-one interview, and who, in a majority of cases were enrolled or lived near the university during the summer.

Criteria for participation included only that the student be Latino/a and majoring in a STEM subject. Thus there were a variety of majors within STEM fields represented in the sample. These included three biochemistry majors, two computer science majors, two mathematics majors, one wildlife ecology major, one clinical lab science major and one chemistry major. All three biochemistry majors and the wildlife ecology major were in graduate school. Six women participated in the study as opposed to four men. Thus this sample was composed of a wide variety of perceptions and viewpoints.

Furthermore there were six first generation college students or first generation college graduates. That is, six students were either among the first generation of their family to attend college or had parents who attended college but never finished. All participants were of Mexican origin, most through both parents. In spite of this, there was a diverse range of responses to the self-identification question (Interview Instrument see Appendix A).

Table 1. Demographic Table of Sample					
Name	Descent	Major	Graduate/Undergraduate	First Generation College Student	Self-Identifies as
Gabi	Mexico	Biochemistry	Graduate	No data	Hispanic (Parents would say Mexican American)
Horace	Mexico	Biochemistry	Graduate	yes	Mexican
Sofia	Mexican	Biochemistry	Graduate	Dad some college. 1 st gen college graduate.	Mexican
Natalie	Mexico (dad) / Native American (mom)	Wildlife Ecology	Graduate	No (1 st gen graduate student)	Hispanic, but Mexican-American to be more concise.
Edgar	Mexico	Applied Mathematics	Undergraduate	no	Chicano
Jose	Mexico	Chemistry	Undergraduate	yes	Hispanic
Lori	Panama (mom) / Mexico (dad)	Clinical Lab Science	Undergraduate	1 st gen college graduate (2 nd bachelor's). Mom had some college.	Heritage hails from Latin America
Maria	Mexico	Computer Science	Undergraduate	yes	Mexican or Hispanic in general.
Mike	Mexico	Computer Science	Undergraduate	Yes, mom is currently enrolled in school.	Hispanic
Jenny	Mexico	Finance and Mathematics (dual major)	Undergraduate	no	Latina/Mexican-American

The Role of the Researcher and the Reflexive Turn

In some ways, looking at the experiences of these students was looking at my own experiences as a Latino graduate student at that same institution. In this sense, I feel this study veers (slightly) from a steady course towards objective truth. Esterberg (2002) describes the reflexive turn as a “need to develop an understanding of how our positions shape the research topics we choose and the methods we use to study the social world” (p. 12). I certainly don’t shy away from the notion that my position as a Latino student led me to this research topic.

Yet there are some immediate differences between the lives of many of these students and my own. Six of the students I interviewed were first generation college students or graduates. My parents, on the other hand, are both PhD educated in the biosciences field. Thus, I was given an advantage, if not from simple generational transference of knowledge, but from the economic advantages that that level of education provides. Therefore, I did not always feel like an insider throughout the research process.

Nonetheless, it is possible that my ethnic identity, the fact that I am a first generation Argentinian immigrant, may have helped me gain some insider status among the students I interviewed. For example, sometimes students would use Spanish words, which I had no difficulty understanding. It was, indeed, a complicated mix of shared understanding (through ethnicity and language) and difference (through nationality and major) that made the insider/outsider dichotomy difficult to ascertain in my case.

At times I would sense an awkward tension as the students revealed their pride in pursuing a STEM field. In a few cases, I felt as if I had to defend the validity of social science. For a while I became interested in the realist versus constructionist debate

(Brown 2001) within the philosophy of science. Leaning towards a constructionist perspective, I wanted to reveal how the prevailing power structure molded students into accepting Anglo bourgeois values and thus to reproduce the industry of science in its present form, albeit with some cosmetic differences. This approach was abandoned for a more empirically minded one, and thus I began to consider different ways to frame the data that at the time were just starting to be collected.

Other times the research process seemed to be a matter of luck. For example, finding the participant, Edgar, was a moment of serendipity that should not be dismissed or taken for granted. This was one of those rare moments where the line between researcher and student at Texas State became most blurry. The truth is I was pursuing nothing but private and personal matters when I attended a film screening of a documentary of the life of Cesar Chavez. It was there that I ran into Jenny, who's Latina sorority, unbeknownst to me, was partly responsible for organizing the event. Jenny was a mathematics major that I had interviewed some days before. When I talked to her, she introduced me to Edgar, with whom I was able to schedule an interview. However, I was surprised that out of a room that seemed to be somewhere between 20 and 30 mostly Latino men and women, Jenny was able to introduce me to only one possible participant.

The reflexive aspect to this study should not be interpreted as dominating the analysis. Indeed, direct reference to me as a researcher is for the most part limited to this section. However, throughout this paper, my role as researcher has always been a central concern, if only because this research fulfills part of the necessary requirements for a Master's degree in sociology at Texas State. The dilemma of social science thus becomes

particularly apparent in that we as human beings are indeed part of the phenomenon we seek to explain.

CHAPTER III

FINDINGS

The purpose of this study is to understand the perceptions and experiences of Latino students in STEM majors at Texas State University-San Marcos. I rely on interviews to study the challenges Latino students face particularly in STEM fields. The goal is to illustrate and describe how their ethnic background and gender identity shape their perception. Specifically, I seek to learn more about student adjustment or transition to college. Second I will examine the factors that led them to major in a STEM subject, and compare and contrast issues and concerns between males and females.

Rough Periods: Adjustment to Academic Life

A positive campus climate can mean the difference between success and failure for a student. The psychological dimension of campus climate involves the perception of individuals towards different aspects of diversity of the campus. Part of this study deals with students' perceptions and experiences related to diversity and multiculturalism. It is important to understand these experiences, as Hurtado et al. (1998) points out how perceptions of racial tension can have significant effects on adjustment to academic life for minority college students.

Many of the students interviewed went through a period of adjustment when entering college, a period that corresponded with a drop in grades particularly in comparison to high school, and in certain cases led to a change of major or career path.

All students describing an adjustment period of this sort said that they eventually got back on track.

Gabi, a biochemistry graduate student, expresses how she went through an adjustment phase as an undergraduate. She describes a “huge jump” between the lax academic standards of high school and the rigorous ones in a highly selective private premedical school. She also describes a period of lack of discipline:

Gabi: ... First my junior year, I found out I had a learning disability, which I didn't know beforehand, because I had been a straight A student honor student, got top twenty percent of my class while in high school. And secondly, I felt that my high school really did not prepare me for the rigorous course load that I went through. And thirdly, I went to a private school; I didn't come here to Texas State.

... and I felt like um, there was a huge jump between high school and a premed program at [private university]. And I definitely wasn't prepared for that. And then, I guess the fourth reason probably would be I kind of went crazy for a while, went out and partied too much, really wasn't disciplined with my studying. Because it was, like, my first time away from home, so...

Gabi's expresses that here grades were not competitive enough for medical school. She attributes this to four things: a learning disability, lack of preparation in high school, the rigorous coursework of the private university and a lack of prioritizing school over recreational time.

Adjustment to academic life, however, can be affected by perceived racial prejudice. This may occur, for example, when one has a vivid sense of their minority status. Students who perceive racial prejudice likely have experiences with race that they view as unfavorable.

Following the adjustment phase, students sometimes change majors and narrow their interests. José, a chemistry undergraduate, initially cites time commitment as one reason to drop premed:

So I went biology, to get my prereques for med school, and that's really the only reason why, to go to med school eventually. But then I started looking more into it and realized the cost of med school and the time commitment and all that, and I was like, nah, I'll just go to chemistry then because it was more what I liked also.

However, José reveals an interesting moment in his experience as a premed student when he describes attending a premed society event where he and his friend were the only Latinos:

...I was in there, it was just me and my friend, I knew from [?], we were the only Hispanics there, and so like I said it goes back to people thinking we're not smart, and she got into med school, so, I mean that kind of just proves that one. And my other friend who's white, he didn't so, that kind of throws that off, and so people always get that misconception, I guess people don't take us seriously at first ...

When José says “us” he is talking about Latinos. His perception is that Latinos are not taken seriously presumably within academia and the scientific community. He also expresses a vicarious sense of pride at his Latina friend's achievements, particularly when compared to his Anglo friend's failure to reach medical school.

Horace, another biochemistry major, unlike Gabi and José, still perceived himself capable of going to medical school, even though all three students experienced going through an adjustment phase. Horace was also a graduate student and like Gabi was pursuing a Master's in biochemistry. However, Horace obtained his bachelor's degree at Texas State, the same university at which he was working on his Master's. In spite of these differences, both Horace and Gabi had reached comparative levels of achievement, since both were attending the same university for the same degree.

In Horace's case, he was able to use his ethnic identity to his advantage. Horace explains how in previous semesters, he helped immigrant students adjust to academic life:

Um, one thing I was like an RA, kind of you could say, they're called PA's though, peer assistant? And it was because of a special program, the [program for immigrant students] so I was able to like, work with first generation students, you know, and then uh, so kind of I met a lot of the challenges they met, with adapting to coming to college, you know being Mexican, all those, for the most part they had a lot of the same challenges that I helped guide them through, because I had already been here two years. So I mean, yeah.

Horace expresses a strong connection to his Mexican cultural roots. His awareness of his own challenges he faced motivated him to work diligently and help others gain motivation as well. Thus Horace connects his adjustment or "adapting" phase to extracurricular activities that help students make a smoother transition from high school to college. He employs, as Oppland (2005) suggest, complex identity constructions into his academic experience.

At times, adjusting to college life can take the form of isolation or alienation from friends and family. Mike came from a small border town in Texas. He became interested in computers in high school, but wanted a deeper level of knowledge than required for work as a technician. He decided to major in computer science and minor in math. Initially Mike had issues making friends in his major while none of his high school friends became STEM majors, specifically math intensive ones:

... Like what happened was that my high school was like three or four hundred people, and we kind of hung out, because I was in mariachi, so that's where, most of my friends were in, and there were like three or four of us that ended up coming here, and I stayed friends with them but it was like their friends, like, the bigger circle, it's kind of being bigger like that, like none of them were technical, they were all like I don't know like music, or English, philosophy, stuff like that, it's just different.

It is interesting to note that Mike's social isolation extended to faculty as well, and may have affected his academic performance. Mike describes not only difficulty making friends, but challenges navigating through the academic structure in general:

Like I don't really have a best friend in computer science, so it was hard for me to first find friends in CS, and then find mentors or stuff like that. And find direction about scholarships, and stuff like that, what I should be doing, so.

It is also important to note that Mike perceives the computer science department as lacking in diversity. When asked about the diversity in the department, Mike responds that it's mostly "mostly white males, from what it seems." Thus, Mike's experiences adjusting to the computer science department has initially been isolating, possibly due to a lack of diversity within the department.

Many of the students interviewed here went through a rough period of adjustment. In one case, this adjustment period was directly tied to perceived discrimination or prejudice against Latinos. In another case, adjustment challenges may have come about due to the department lacking diversity. This adjustment period also led students to rethink their academic goals, and often resulted in a change of major or program or poor academic performance. All the students claimed to have overcome this particular challenge. However, since no follow up interviews were conducted, it is difficult to ascertain to what extent these students actually adjusted to academe and actually succeeded in graduating and obtaining employment.

The Role of Student Organizations

Participating in students organizations provided students with a sense of identity which their respective course curricula do not offer. Their participation in student organizations in turn motivated them and provided them a sense of purpose, especially among organizations that reflected Latino culture. Participating in these organizations, however, often came at the cost of “time on task” as Cole and Espinoza (2008) hypothesize. For example, Horace dedicated much of his time to student organizations as an undergraduate. Of note is that not all the organizations Horace mentioned were specifically focused on Latino issues. Horace’s participation in student organizations runs the gamut from helping freshmen students adjust to college to student government. Yet he expresses that such involvement was time consuming:

As an undergrad, I was really involved with a lot of things, um, not so much now, it’s been um, kind of just, I’m in here probably like, twelve hours a day, so it’s hard to get out there, but uh, I did it all.

The various student organizations that Horace was a part of were not always geared towards Latino students and increasing awareness of Latino culture. They did, however, indicate an awareness to the needs of different communities. Student government, for example, represents the needs of the student community, while the Young Men Against Violence organization (pseudonym) reflects a need in the community of young men who oppose violence as a means to solve problems.

Similar to Horace, Gabi, a biochemistry major, perceives that graduate school takes up too much time to be heavily involved in student organizations. Gabi perceives opportunities that her Latina sorority offers, however, as stated here, these opportunities

require time and consistency that she is unable to offer. These opportunities often revolve around mentoring and providing leadership roles to children and young people:

I've been offered a lot, with a lot of those organizations, and I actually do interact with those organizations a lot, with my sorority, it's a Latina based sorority, on top of that. So, just because of where I'm at in my life, I haven't really taken advantage of those opportunities, I wish I could, I wish I had time to do that, but right now I have such a crazy schedule. I know those organizations value people that are consistent, because that's what kids need is consistency, and right now I can't.

Thus Gabi faces a common dilemma. Participating in diversity functions can lead to opportunities through networking and resume building. Yet at the same time, these activities can take away from time spent studying or working on research. As with Horace, Gabi prioritizes school work, and thus chooses to forgo participating in extracurricular activities.

Edgar is a student studying mathematics and is very active in student organizations. Of course, Edgar is an undergraduate, and so it is possible that the lighter work load for undergraduates gives them more opportunities and time to participate in these activities. Edgar's participation is strongly geared towards Latino issues. He is a member of a Hispanic student organization, a Hispanic organization for young men, and a bilingual student's organization. Edgar describes what the bilingual student organization does:

Well, it's just kind of like, we talk about different opportunities for um, those who want to get bilingual education. And um, we definitely have discussions about how, about how the whole thing the students that come from Mexico, they don't know a thing about English, you know, it's just about being taught, you know just different things come up, especially about current events, things like that. We try to um, identify it with that.

Not only does Edgar view these organizations as venues for advancement and opportunity, his last comment is indicative that these organizations serve as a locus for

identity formation and solidification. Unlike Horace who joined several multicultural, albeit not specifically Latino, organizations, Edgar's extracurricular activities are almost exclusively focused on Latino issues.

There is a sense too that student organizations such as Latina sororities relate to identity through multifaceted interactions with the community. Natalie, a wildlife ecology graduate student, provides an interesting example of intersections of ethnicity and gender and how these interact with the local community. She describes how when she came to Texas State, she helped found her sorority chapter here:

Well at the other university I joined the [student organization for Hispanics], and then I also joined a sorority, a Latina sorority, and they deal with women empowerment and spreading Latina cultural awareness, and things like that, so I joined it there, and it actually got started here, the same semester I joined. So when I came over here it had already been started, so I helped kind of found it in a way.

It is clear that participating in and even helping to organize her sorority was important for Natalie. Natalie's involvement in the sorority connects her concern with Latina issues with the need for community improvement activities. Through the use of words like "empowerment" and "cultural awareness" Natalie indicates her Latina sorority engage the community and in doing so affect it towards improving the situation of many Latinas. In this sense, student organizations such as Latina sororities offer advantages not only to the students who participate in them, but to the broader community and public. For its participants, Latina sororities provide opportunities to network, meet and work with different faculty (possibly of different departments), and build social skills by providing a social basis which encourages Latina culture and identity. For the broader community, raising awareness of Latina issues helps create counter stereotypes and negative perceptions.

Jenny is a mathematics major from a small town near the Mexico Texas border. A native Spanish speaker, Jenny was in her third year of college when the interview was conducted. When asked about advice she would give new students, Jenny suggests that participating in diversity activities is a crucial aspect of adjusting to academic life:

Use your resources, definitely. For me, you know coming here; you knew I had an accent, figured that out quickly. You know, I immediately went to different organizations and groups that are for Latinos, or Hispanics, or Latinas, and you know, find help, find those people who are like you, and that can relate to you and how you grew up...

These organizations, thus, seem to offer a network of support, where students can both provide and get help for various things related to academic life. For Jenny, this means finding people that one can relate to, that share similar experiences. Student organizations provide students with a sense of meaning to what they are doing. They contextualize student's experiences within their communities, and in doing so, engage students in developing various identities. Student organizations also provide students with a stronger connection to the institution. As a latent effect, they may also promote retention and recruitment as well as helping students adjust to academic life.

While Cole and Espinoza (2008) find that being involved in diversity functions is negatively correlated with GPA, within this group, Latino students seem to suggest that being involved in student organizations has helped them adjust to academic life at Texas State. Overall, it is likely that student organizations and other types of on campus extracurricular activities make Latino student experiences at their institution more enjoyable.

Differences between Men and Women in STEM majors

Whereas bioscience degree holders tend to be evenly distributed by gender, mathematics and computer science tend to be dominated by men. Nonetheless, this does not deter some women from participating and pursuing these fields. This section investigates the differences between men and women in different fields, some which are predominantly male and others that are not. I wanted to find out if there were differences in the experiences of men and women in STEM majors. Indeed, the main difference that students expressed was related to the degree that ethnicity and gender played in their perceived barriers to achievement. Women were more likely than men to foreground gender as shaping the challenges they faced, minimizing the effects of ethnicity in this respect.

Diversity, of course, should refer to race and ethnicity as well as gender. Maria is a computer science major in a predominantly male field. For Maria, the issue of ethnicity is not as salient. Instead, she finds that there is a high premium to being a woman in computer science. Maria talks about being alienated from the few other women in the computer science department. However, she also talks about a friendship she was able to develop for a while:

There are, what, one...two...three, I think there's about three or four other females in the upper level computer science classes with me that I can think of ... But, um, we're kind of alienated from each other in a weird way. Like I never really made friends with one of the other computer science majors until our, her senior year in college, and I kind of realized, this is a really cool person, why haven't I ever talked to her before, and we had classes together.

This indicates that Maria is fully aware of the gender disparities in her major. These gender disparities can lead to alienation among numerical minorities. Sometimes,

students find that it is possible to break through the sense of alienation and form meaningful bonds.

However, there are instances where such gender disparities can become pronounced and harmful. Institutions are generally thought of as being sensitive to the needs of minority groups. Unfortunately this is not always the case. In fact, there are times when those individuals that hold the institutions in place, such as faculty, staff and administration, can create an environment of downright hostility for students. This can be seen, for example, in one of Maria's professors:

Um, I've had, there's one professor in the computer science department who, um, is kind of known for his sexist comments that he makes in class very often. Um, I remember classes with him where he would say things like, it's surprising that we can focus on getting a degree when we want to be making babies, and stuff like that.

When faculty say things such as these, not only does it prove harmful for students' sense of self-efficacy, but it also shows where campus climate could be improved. Maria was not only affected on an emotional level, the professor's insensitive remarks affected her performance in that class and her overall GPA:

Um, academically, it probably only affected me for his class, just because I reached the point of not caring what he said, and not caring about the class. And I usually care about my grades a lot, but I just didn't care about turning assignments in, I didn't care about doing anything for this man, type of thing. So, I got a B in the class, which I don't like, I like trying to achieve A's and whatnot...

On the positive side, Maria achieved a high grade in the class. The downside is that she may have been able to achieve even better marks had her professor been more sensitive. She clearly articulates a lack of motivation to do work for that particular course. An otherwise productive and high achieving student, Maria was unable to cope with the hostile environment to the extent she would have liked. The fact that she achieved a high

mark anyway suggests that Maria has developed coping skills necessary for the trials that come with being a woman in a predominantly male field.

Even though Gabi is in a major that is more evenly distributed between men and women, she also feels she has to contend with challenges as a result of her gender. Gabi explains how she does not feel affected by her ethnicity so much as her gender:

I don't have to break through the Hispanic or Latino stereotype. I have to break through the woman stereotype for the main part. And I've seen this with several different um, women in science, that are several different ethnicities. And they kind of sort of told me the same thing too. The stereotype that you have to break down is being a woman in science, because it's kind of like, they don't take you seriously, I don't know if you understand that.

Although other STEM fields such as computer science and engineering have very dramatic gender differences, the differences in biochemistry are not as pronounced (NCES 2009b). Yet Gabi still connects some of the difficulties she has faced in school to her womanhood, and the notion that because she is a woman, she may not be taken seriously.

Unlike women in STEM majors, who may feel that their gender brings with it challenges in their field, men tended to express that their Mexican identity is more salient as a sometimes problematic aspect of working in a STEM discipline. This is not to say women did not express cultural awareness and ethnic identity. However, the women in this study were less likely to feel that their ethnic background could be a source of things such as stereotype threat. Stereotype threat (Steele 2006) refers to the fear or threat of confirming a racial stereotype. It is possible that Latinas experience gendered stereotype threat more saliently than Latinos do.

In Horace's case, he seems to suggest that there is some stereotype threat link to his Mexican roots and the culture of academia. This is expressed as a concern with a lack of communication skills, what is more likely to be an intolerant atmosphere towards diverse cultures:

I wouldn't say like outright, but um, I think you kind of have like a sense, that you know, that you don't communicate as well with the other uh, professors, and I guess it kind of always feels that way. I don't know if that's something to do with me, or if it is something that's there. It's uh, definitely different, it's not, I don't think it's the same for me as for someone that's not you know, Mexican or Hispanic, but not so much where you would say that's it blatant. But it's always like, you feel different.

Ethnic and gender identities provide both support to students, however it also brings with it challenges. Women are more likely to see gender as resulting in challenges, whereas men were more likely to face challenges as a result of ethnicity. However, for men, this may sometimes project class concerns.

CHAPTER V

DISCUSSION AND CONCLUSION

I attempted to examine the different perceptions and experiences of Latino students in STEM fields at Texas State. Findings indicated that the students interviewed often went through a period of adjustment, where, compared to high school, grades dropped, and that a change in major or program also sometimes occurred. Findings also suggested that student organizations often help students adjust to academic life, offering a locus of social activity which reinforces identity constructs such as ethnicity or gender.

Identity is important in studying Latinos in STEM majors because Malcom (2008) shows how success in a calculus workshop can be achieved by incorporating complex identity constructs into the curriculum. In Malcom (2008), students were able to construct “math identities,” through incorporating gender, class and ethnicity constructs. Identifying positively with mathematics in this way leads to high achievement. The way that the students in this study interacted with student organizations suggests that they were incorporating their identities as Latinos and Latinas into their academic experiences, and in doing so, had accessible to them a platform from which to hash out issues of identity as they related to their experiences at school.

However, as Cole and Espinoza (2008) point out, participation in student organizations can often come about at the cost of “time on task.” Cole and Espinoza (2008) actually found that participating in student organizations was negatively correlated

to GPA. Based on the methods of this study, there is no way to confirm this correlation. Nonetheless, it is of note that of the students who mentioned participating in student organizations, it was those whom were presumably the busiest, that is the graduate students, which spoke about lacking time to engage student organizations as they had done as undergraduates. This, however, wasn't the case always as one graduate student still found time to be active in her Latina sorority.

Hurtado et al. (1998) points out how minorities in majority white environments can often feel minority status stress. Certain students' narratives indicate that they may have felt minority status stress as a result of underrepresentation much as Hurtado et al. (1998) explains. José and Mike both experienced situations in their respective departments which indicate this possibility. It is also worth noting how Espinoza (2008) found that students were conscious of being underrepresented on the campus overall, but not within the engineering department she studied. Similarly, in this study, students did often express things that suggest that they were conscious of underrepresentation, however, even within certain departments or organizations (computer science, premed society), students found that ethnicity was very salient.

Students whose minority status is saliently felt may also feel stereotype threat. Steele (2006) explains how stereotype threat is the threat or fear of confirming negative stereotypes about race. The question as it relates to this study, then, must be: Do Latino/a students experience stereotype threat, and what, if anything do HSIs do to minimize it? In this study, it appears as some students did feel stereotype threat, possibly during adjustment to academic life. As many of the students in this study came from

predominantly Mexican-American parts of Texas, stereotype threat may have occurred when confronted with a Latino minority population.

These results cohere with the idea that as a non-Hispanic majority HSI, Texas State may in some ways act like other HSIs, but in other way may act more like a predominantly white institution. Since HSI status is determined by enrollment rates rather than a specific mission to serve Latinos, it is important to note that Texas State, particularly as an HSI with lower Latino presence, may not be any better suited for Latinos than a predominantly white institution with a comparatively high Latino population or emerging HSIs.

Conclusion

In studying the experiences and perceptions of Latino students in STEM majors at Texas State, it was determined that students often went through a period of adjustment that often resulted in a change in major or program and/or a drop in grades. Student organizations helped students through their adjustment phase and provided a locus of social activity from which to develop and reinforce gender and ethnic identity. Women and men had at times different experiences, where women were more likely to diminish the role of ethnicity in contributing to the challenges they faced, and foreground their gender in this respect.

APPENDIX A

INTERVIEW GUIDE

Statement: Thank you very much for participating in this study. I am interested in the experiences of Latino and Latina STEM or Science, Technology, Engineering and Mathematics majors. We are interested in your unique experience as an individual, so please try to be as honest as possible. We will start with a little background information about you...

Background

1. What is your nationality of origin or which country or countries do you trace your ancestry to?
2. When do you plan on graduating?

Motivation and Decision to Major in STEM

3. What is your major?
4. How long have you had this major?
5. Have you had any other majors?
6. Why did you choose that major?
7. How would you describe your academic performance?

Experiences as a STEM major at Texas State

8. What are your experiences as a STEM major at Texas State University?
9. What are some challenges you have faced as a Latino/a?
10. Have any of these challenges been school related? If yes, describe them.
11. Have you been in situations in school where you have been treated differently because you are Latino/a in STEM?

Probe: for information about experiences with prejudice or discrimination.

12. Who are the persons who support you?

Probe: for information about resources such mentorship and financial resources.

Future Goals

13. What are your future goals in a STEM field?
14. What advice would you give other Latinas/os just entering college?
15. Would you recommend incoming freshmen to become a STEM major?

APPENDIX B

CONSENT FORM

A Study of Latinos and Latinas in STEM Majors

You are invited to participate in a study of men and women who have chosen a Science, Technology, Engineering and/or Math (STEM) field as their major. My name is Mariano Conti. I am a student at Texas State University in the Department of Sociology working on a new research study for my Master's thesis. My contact information is: 512-705-6714, or mc1597@txstate.edu.

You were selected as a possible participant in this study because you identify as Latina/o or Hispanic and you are working towards a degree in a STEM field. You either volunteered for the study by responding to a flyer, or someone you know referred you to me. You will be one of 16 people chosen to participate in this study. If you choose to participate, I will ask you questions about your school experiences, for example, your motivation and decision to become a STEM major, your educational experiences and future goals in STEM.

If you decide to participate, you will take part in a one-on-one in-depth interview with me. The interview will be audio-tape-recorded and should take no more than one hour of your time. The possible risk to your participation is psychological harm from describing/re-living past events and interactions that may have been negative or damaging. Agencies that might be helpful to you include the Office of Multicultural Student Affairs (512-245-2278), the Office of Equity and Access (512-245-2539) and the Texas State University Counseling Center (512-245-2208). If you use the services of a counselor, fees will be your own. A possible benefit is discussing student experiences that you might not have described prior to participating in the study.

Any information that is obtained in connection with this study and that can be identified with you will remain **strictly confidential**. Audio files will be assigned a code number so your name will never be attached to the audio files. Only I, the interviewer will hear your interview on the digital recorder, and I will keep the recorder locked in a file cabinet until the study is finished. At that time, I will erase the recordings of your interview. When I describe the information obtained, an alias or false name will be used in place of your true name or identity and the name of your school. I will not transcribe any identifying information.

If you decide to take part in the interview, you are free to stop the interview at any time. You can withdraw from the study without prejudice or jeopardy to your standing with Texas State University. You don't have to answer any question that makes you uncomfortable. If you have any questions, please ask me. I can send you a summary of the study if you like. The Texas State Institutional Review Board has approved this study.

You will be offered a copy of this form to keep. If you have questions in the future, please contact me. With questions or concerns about your rights or this research, you may also contact the Institutional Review Board chairperson at Texas State, Dr. Jon Lasser (512-245-3413, lasser@txstate.edu) or the Office of Sponsored Projects administrator, Ms. Becky Northcut (512-245-2102). You may also contact my supervising professor, Dr. Gloria Martinez (512-245-2470, gm21@txstate.edu).

You are making a decision whether or not to participate in this study. Your signature means that you have read the information provided above and have decided to participate. You may withdraw at any time after signing this form should you choose to do so.

Signature of Participant

Date

Signature of Investigator

Date

APPENDIX C

RECRUITMENT FLIER

**Seeking Latina/o Science, Technology,
Engineering and Math (STEM) Students!**

I am a graduate sociology student doing my Master's thesis on Latinas/os in science technology, engineering and/or math fields.

You are invited to participate in a sociological study concerning your experiences studying Science, Technology, Engineering and/or Math (STEM).

If you are Latina/o, Hispanic, Chicana/o or identify as having roots from Latin America, and are majoring in any science, technology, engineering and/or math field, you qualify for the study!

Students who choose to participate will be interviewed about their experiences in school. Interviews are roughly 45 minutes long and completely confidential.

**For more information contact Mariano Conti, Sociology Graduate Student.
mc1597@txstate.edu.**



REFERENCES

- "2010-11 Hispanic Serving Institutions." 2011. Hispanic Association of Colleges and Universities, Retrieved September 4, 2011.
(<http://www.hacu.net/images/hacu/OPAI/2010%20Fed%20HSI%20list.pdf>).
- Agger, Ben. 1991. "Critical Theory, Poststructuralism, Postmodernism: Their Sociological Relevance." *Annual Review of Sociology* 17:pp. 105-131.
- Brown, James R. 2001. *Who Rules in Science? : An Opinionated Guide to the Wars*. Cambridge, Mass.: Harvard University Press.
- Crisp, Gloria, Amaury Nora and Amanda Taggart. 2009. "Student Characteristics, Pre-College, College, and Environmental Factors as Predictors of Majoring in and Earning a STEM Degree: An Analysis of Students Attending a Hispanic Serving Institution." *American Educational Research Journal* 46(4):924-942. doi: 10.3102/0002831209349460.
- Cole, D. and A. Espinoza. 2008. "Examining the Academic Success of Latino Students in Science Technology Engineering and Mathematics (STEM) Majors." *Journal of College Student Development* 49(4):285.

Collins, Patricia H. 2003. "Towards an Afrocentric Feminist Epistemology." Pp. 350 in *Social Theory: Roots and Branches*. Vol. 2, edited by P. Kivisto. Los Angeles, California: Roxbury Publishing Company.

Dowd, A. C., L. E. Malcom and E. M. Bensimon. 2009. *Benchmarking the success of Latino and Latina students in STEM to achieve national graduation goals*. Center for Urban Education. Los Angeles, CA: University of Southern California. Retrieved March 28, 2011 (<http://cue.usc.edu/news/NSF-Report.pdf>).

Espinoza, A. 2008. "The college labyrinth: The educational course of first-generation Latino students in engineering." M.A. dissertation, University of Southern California, United States – California.

Esterberg, Kristin G. 2002. *Qualitative Methods in Social Research*. Boston, Mass: McGraw-Hill.

Godoy, C. 2010. "The contribution of HSIs to the preparation of Hispanics for STEM careers: A multiple case study." Ed.D. dissertation, University of Pennsylvania, United States – Pennsylvania.

Hayes-Bautista, David and J. Chapa. 1987. "Latino Terminology: Conceptual Bases for Standardized Terminology." *American Journal of Public Health* 77(1):61-68.

Hurtado, Sylvia, Jeffery M. Milem, Alma R. Clayton-Pederson and Walter R. Allen.

1998. "Enhancing Campus Climates for Racial/Ethnic Diversity: Educational Policy and Practice." *The Review of Higher Education* 21(3):279. Retrieved April 1st 2011
(http://muse.jhu.edu.libproxy.txstate.edu/journals/review_of_higher_education/v021/21.3hurtado.html).

Laden, Berta V. 2001. "Hispanic-Serving Institutions: Myths and Realities". *Peabody Journal of Education*. 76(1):73-92.

Gerson, Timi, R. Islas, Fiona Wright, Adalila Zelada, Karinne M. Hernandez, and Audrey Ayao. 2004. *Another Americas is Possible: The Impact of NAFTA on the U.S. Latino Community and Lessons for Future Trade Agreements*. Labor Council for Latin American Advancement and Public Citizen's Global Trade Watch. Washington D.C. Retrieved November. 9,
(<http://www.globalexchange.org/sites/default/files/AnotherAmericasisPossible.pdf>).

Malcom, L. E. 2010. "Charting the pathways to STEM for Latina/o students: The role of community colleges." *New Directions for Institutional Research* 2010(148):29-40.

Malcom, L. 2008. "Accumulating (dis)advantage? Institutional and financial aid pathways of Latino STEM baccalaureates." Ph.D. dissertation, University of Southern California, United States – California.

Mestre, Jose P. 1981. "Predicting Academic Achievement Among Bilingual Hispanic College Technical Students¹²." *Educational and Psychological Measurement* 41(4):1255-1264.

National Science Board. 2010. *National Science Indicators: 2010*. Arlington, VA: National Science Foundation.

Oppland, S. 2010. "The inextricability of identity, participation, and math learning among Latino/a undergraduate students." Ph.D. dissertation, University of Illinois at Chicago, United States – Illinois.

Passel, Jeffrey S. and D’Vera Cohn. 2008. *U.S. Population Projections: 2005–2050*. Washington D.C.: Pew Research Center. Retrieved August 26, 2011 (<http://pewhispanic.org/files/reports/85.pdf>).

Santiago, D. 2006. *Inventing Hispanic-Serving Institutions (HSIs): The Basics*. Excelencia in Education. Washington, DC. Retrieved November. 9, 2011(<http://eric.ed.gov/PDFS/ED506052.pdf>).

Solorzano, D. G. and A. Ornelas. 2002. "A Critical Race Analysis of Advanced Placement Classes: A Case of Educational Inequality." *Journal of Latinos and Education* 1(4):215-229.

- Steele, Claude. 2006. "Chapter 29: Stereotype Threat and African-American Student Achievement." Pp. 252-257 in "Chapter 29: Stereotype Threat and African-American Student Achievement." Perseus Books Group
(<http://search.ebscohost.com.libproxy.txstate.edu/login.aspx?direct=true&db=sih&AN=50322670&site=eds-live>).
- Strauss, Anselm and Juliet Corbin. 1998. *Basic of Qualitative Research: Techniques and procedures for Developing Grounded theory*. London, England: Sage Publications.
- US Department of Education. 2011. " Definition of Hispanic-Serving Institutions.", Retrieved August, 22, 2011.
(<http://www2.ed.gov.libproxy.txstate.edu/programs/idueshsi/definition.html>).
- U.S. Department of Education, National Center for Education Statistics. 2010. "Table 298: Bachelor's degrees conferred by degree-granting institutions, by sex, race/ethnicity, and field of study: 2007-2008." Retrieved May 3, 2011
(http://nces.ed.gov/programs/digest/d10/tables/dt10_298.asp).
- U.S. Department of Education, National Center for Education Statistics. 2009a. "Table 285: Bachelor's degrees conferred by degree-granting institutions, by race/ethnicity and sex of student: Selected years, 1976-77 through 2007-08." Retrieved on May 3, 2011
(http://nces.ed.gov/programs/digest/d09/tables/dt09_285.asp).

- U.S. Department of Education, National Center for Education Statistics. 2009b. "Table: 286: Bachelor's, master's, and doctor's degrees conferred by degree-granting institutions, by sex of student and discipline division: 2008-09." Retrieved September 9, 2011 (https://nces.ed.gov/programs/digest/d10/tables/dt10_286.asp).
- U.S. Census Bureau. 2011. "Table 806: Table 806. Science and Engineering (S&E) Degrees Awarded by Degree Level and Sex of Recipient: 1990 to 2008." Retrieved May 2nd, 2011 (www.census.gov/compendia/statab/2011/tables/11s0806.pdf).
- U.S. Census Bureau. 2010. "Overview of Race and Hispanic Origin: 2010." Retrieved May 2nd, 2011 (www.census.gov/prod/cen2010/briefs/c2010br-02.pdf).

VITA

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