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Learning Style Differentiation between Hispanic and Non-Hispanic College Students in
Selected Institutions in the North Carolina Public University System

By

Robert C. Tripp

A DISSERTATION

Presented to the Faculty of
The Graduate College at the University of Nebraska
In Partial Fulfillment of Requirements
For the Degree of Doctor of Philosophy

Major: Educational Studies
(Educational Leadership and Higher Education)

Under the Supervision of Professor Richard Hoover

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Learning Style Differentiation between Hispanic and Non-Hispanic College Students in
Selected Institutions in the North Carolina Public University System

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University of Nebraska, 2011

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As the Hispanic population increases in North Carolina the number of college graduates of Hispanic descent should follow. Although a gradual increase in Hispanic students attending state universities has been seen, the increase has not kept pace with the increases seen in the general population. Additionally, the numbers of those achieving the baccalaureate degree have not increased. There have been a number of research projects in recent years that have documented qualitative reasons why Hispanic students have been reluctant to go to college and the factors that contribute to their success and failure at institutions of high education. Cultural influences on learning preferences have been theorized as one such factor. This project sought to establish a quantitative analysis of learning styles for Hispanic students as compared to non-Hispanic students.

The researcher used quantitative methods to study learning styles as measure by the Index of Learning Styles (ILS) developed by of Richard Felder and Barbara Soloman (1991). Undergraduate students from four state universities in North Carolina were studied for a relationship between learning styles and ethnicity, and the interaction of gender and ethnicity.

No relationship between ethnic identification and learning style was established; there was no significant difference in learning styles for Hispanic and non-Hispanic

students. However, the interaction of ethnicity and gender showed an effect; Hispanic males and non-Hispanic females appeared to be more similar in degree of learning style preferences as compared to non-Hispanic males and Hispanic females.

The lack of substantial differences in learning styles between Hispanic and non-Hispanic learners and the interaction effects described above highlight the complex and individual nature of learning styles. This research suggested that while learning styles may be a useful tool for self-assessment and personal understanding their use in broader programming needs to be undertaken with caution. The diverse nature of students and their learning styles necessitates planning, programming and teaching that is equal in diversity of approach.

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your age. To my wife, Amy, who never truly understood this endeavor, I hope that I am as patient with your dreams as you have been with mine. I love you all.

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Chapter 1

Introduction

Background

Nationally, the 1990's was a time of substantial growth in the Hispanic population. However, the percentage of Hispanic high school graduates who went to college dropped during this time (Vernez & Mizell, 2002, p. 22). Although, in the past ten years there has been a stabilization and even an increase in both high school graduation and post-secondary attendance, the Bachelor degree completion rates have continued to fall below the averages for other demographics of students (Fry, 2005, p. 10; United States Census Bureau, 2001). Research by Rendon and Valadez (1993), Vasquez (1998), Gonzalez, Jovel and Stoner (2004) and Bohon, McPhearson and Atilas (2005) have documented qualitative reasons why Hispanic students have been reluctant to go to college and the factors that contribute to their success and failure at institutions of higher learning. Family commitments, economic considerations, a lack of understanding of the educational system, lack of access to schools and people with higher educational backgrounds all seem to be common challenges for the Hispanic students.

Furthermore, researchers like Hernandez (2000) and Pidcock, Fischer and Munsch (2001) have recognized the cultural and behavioral differences among Hispanic students as compared with their counterparts from other ethnic and racial identities. Some research has even noted apparent differences in learning styles (Sanchez, 2000).

Problem

The disparity between baccalaureate completion in Hispanic students, those students of Hispanic origin, from Spain or any Spanish speaking country from South

America or Central America, and the general population has been particularly significant in North Carolina (U.S. Census, n.d.b). The state saw a Hispanic population growth of 394% from 1990-2000 with an additional 55% between 2000 and 2006 (North Carolina Rural Economic Development Center, n.d. In-migration of Hispanics, ¶1; United States Census Bureau, n.d.c). However, six-year graduation rates for Hispanic students from the University of North Carolina system showed little evidence of this increase; remaining consistently lower than the all student average and significantly lower than the average for Caucasian students (University of North Carolina-Academics, 2009). There have been a number of research projects in recent years that have documented qualitative reasons why Hispanic students have been reluctant to go to college and the factors that contribute to their success and failure at institutions of high education. Cultural influences on learning preferences have been theorized as one such factor (Bohon et al., 2005; Gonzalez et al., 2004; Hernandez, 2000; Pidcock et al., 2001; Rendon & Valadez, 1993; Sanchez, 2000; Vasquez, 1998).

Purpose Statement

The purpose of this study was to determine if there are discernable, quantifiable differences of learning styles for undergraduate Hispanic students as compared to non-Hispanic undergraduate students. The study quantifiably categorized learning preferences using Felder and Soloman's (1991) Index of Learning Styles, or ILS. The ILS was designed to assess preferences across four dimensions or domains: active/reflective, sensing/intuitive, visual/verbal, and sequential/global (Felder & Soloman, 2001, pp. 1-4). Analysis on the categorized learning styles was conducted to look for significant relationships between learning style and ethnic identity. Further

analysis was done to look for interaction effect in relationships and differences of learning styles based on ethnic identity and gender. This information was utilized to make recommendations on methodological strategies for educational activities, services and environments that address the learning needs of the Hispanic population who attend state-funded, or “public,” post-secondary institutions.

Research Questions and Hypotheses

Research Question 1: Is there a correlation in a student’s learning style as measured by the Index of Learning Styles (ILS) and a student’s ethnic identity as Hispanic or non-Hispanic?

Research Question 2: Is there a correlation in a student’s learning style as measured by the Index of Learning Styles (ILS) and the interaction of college students’ ethnic identification as Hispanic or non-Hispanic and gender?

Research Question 3: Is there a difference in a student’s learning style as measured by the Index of Learning Styles, ILS, based on a student’s ethnic identity as Hispanic or non-Hispanic?

Research Question 4: Are there differences in learning styles as measured by the ILS for college students identifying as Hispanic or non-Hispanic based on gender?

Corresponding Research and Null-Hypotheses for each of the stated research questions will be presented and explained in full in Chapter 3 on page 46.

Definitions

Hispanic and Latino: Although these terms are not necessarily synonymous they are used as such by many, including the United States Census Bureau (n.d.a, Ethnicity, ¶1). The terms are both used to describe ethnicity or people from an ethnic origin usually

referring to those having a cultural heritage from Central or South America and the Caribbean (U.S. Census, n.d.a, Hispanic or Latino origin, ¶1). Strictly speaking the term Hispanic refers to a person of Hispanic origin, from Spain or any Spanish speaking country from South America or Central America. This definition refers to persons who self-identify their origin as Mexican-American, Chicano, Mexican, Mexicano, Puerto Rican, Cuban, Central or South American, or from other Latino heritage (U.S. Census, n.d.b). The term Hispanic was a term created by the United States government during the civil rights era as a response to lobbying from the Spanish-speaking community. The term has been utilized by governmental agencies for social and demographic tracking purposes (Vazquez, 2004, Origins ¶1). The terms Latino and Latina emerged from the Latino community as a less formal self-description, these terms are more often used by people and/organizations with a cultural connection to the community (Vazquez, 2004, Origins ¶2). This term is more strictly defined as someone who is from Latin America, more specifically Central America (including Mexico), South America and the Caribbean. Latina/o thus includes those people from this region who might not speak Spanish, i.e., Brazilians whose primary language is Portuguese or people from areas within the region who speak native languages. Use of the different terms is mostly reliant on political, social or generational factors and not upon the definitional disparities. Whereas the terms Latino or Latina are commonly used in North Carolina, the place of the study, this paper will review literature using both terms. However, because Hispanic is definable for demographic purposes, by governmental agencies, and categorical data, the term Hispanic will be used in the study to define the sample.

Ethnic Identity: Ethnicity, or ethnic identity, in a broad sense is the identification with or membership in a particular racial, national, or cultural group and observance of that group's customs, beliefs, and language. (American Heritage New Dictionary, n.d., Ethnicity, ¶3).

However, this study will focus on the definition and parameters of ethnic identity utilized by the United States Census Bureau.

There are two minimum categories for ethnicity: Hispanic or Latino and Not Hispanic or Not Latino. The federal government considers race and Hispanic origin to be two separate and distinct concepts. Hispanics and Latinos may be of any race. (U.S. Census, n.d.a, Ethnicity, ¶2)

Learning Style: Felder, the originator of the Index of Learning Styles, ILS, the instrument utilized in this study defines learning styles as the strengths and preferences in which a person “takes in and processes information” (Felder & Spurlin, 2005, p. 103). Felder and Soloman (2001) define eight categories of learning styles preferences across four dimensions of learning styles: active or reflective, sensing or intuitive, visual or verbal, and sequential or global.

Active Learning: A learning style preference where processing information comes through “engagement in physical activity and discussion” (Felder, 1993, p. 2). Active learners retain and understand information best by doing something active with it; discussing the information, applying the information, or explaining it to others (Felder & Soloman, 2001, p. 1).

Reflective Learning: A learning style preference where processing information comes “through introspection” (Felder, 1993, p. 2). Reflective learners understand and retain information when they can contemplate and think about it (Felder & Soloman, 2001, p. 1).

Sensing Learning: A learning style preference where perception of information comes from “sights, sounds and physical sensations” (Felder, 1993, p. 1). Sensing learners prefer learning facts and solving problems through established methodology (Felder & Soloman, 2001, p. 1).

Intuitive Learning: A learning style preference where perception of information comes from “memories, insights and ideas” (Felder, 1993, p. 1). Intuitive learners like to “discover possibilities” and explore relationships (Felder & Soloman, 2001, p. 1).

Visual Learning: A learning style preference where sensory information is perceived most effectively visually through “pictures, diagrams, charts or demonstrations” (Felder, 1993, p. 1). Visual learners remember best those things they can see (Felder & Soloman, 2001, p. 2).

Verbal Learning: A learning style preference where sensory information is perceived most effectively through words, both written and spoken, sounds and formulas (Felder, 1993, p. 1). Verbal learners like written and spoken explanation of concepts (Felder & Soloman, 2001, p. 2).

Sequential Learning: A learning style preference where progress towards understanding happens through a logical progression of incremental steps (Felder, 1993, p. 2). Sequential learners solve problems step by step in a linear fashion (Felder & Soloman, 2001, p. 3).

Global Learning: A learning style preference where progress towards understanding comes “holistically in large jumps” (Felder, 1993, p. 2). Global learners tend have “aha!” moments, which Felder and Soloman (2001) describe as “a sudden flash of understanding” when they see the big picture (p. 3). Global learners may be able to

solve complex problems in unique ways but lack the sequential understanding to be able to explain how they got to the resolution (Felder & Soloman, 2001, p. 2).

College Student: Although there may be many different levels of student, i.e., graduate/undergraduate, attending/persisting, registered full-time or part-time, for the purposes of this study the term college student refers to an individual who falls into the parameters of a registered undergraduate student attending an institution of post-secondary learning.

Assumptions

Assumptions are the ideas and/or preconceptions a researcher brings to the project based on his/her own observations and experiences. Bryant (2004) noted that it is important to identify the major assumptions of a study to legitimize the research (p. 52).

This study was based on three major assumptions. The first was that there are cultural differences which impact persons who are Hispanic and differentiates their experiences and perceptions from other ethnic and racial populations. The second was that the desire to achieve higher levels of education is not chiefly among these differentiations. Finally, there was an assumption that students will be capable of understanding the research instrument, the Index of Learning Styles, and that they would be willing to take it. The cultural and language differences to which many Hispanic students are exposed can make comprehension of certain English words and phrases confusing. The researcher made the assumption that as college students these students have the ability to translate and comprehend verbal material at a higher level than that of the instrument.

De-limitations

De-limitations are those factors which narrow the scope of the project or restrict the generalization of findings in the study based on research design (Bryant, 2004, p. 53; Creswell, 1994, p. 110). This study had two major de-limitations, the sample group and timing. The sample for this study was derived using students from selected publicly funded colleges and universities in the state of North Carolina. Students who attend private institutions may have some socio-economic differences from the study sample and thus could differ in their learning experiences and the way they process information, their learning style. Socio-economic status was not measured as part of the study. Furthermore, students in other states and other regions of the country could also have different experiences and exposure to cross-cultural activities that also could impact their learning experiences. Additionally, information from the sample was gathered during the latter part of the first decade of the two thousandth millennium, a time of dramatic increase for the Hispanic population in North Carolina. As the Hispanic population becomes in-cultured, or Americanized, the inherent cultural differences could dissipate or weaken and this could shift personal learning experiences and learning styles (Portes & Rumbaut, 2001, p. 281).

Limitations

Limitations, or potential weaknesses in the study, are those factors which restrict the findings in the study based on research methodology (Bryant, 2004, p. 53; Creswell, 1994, p. 110). This study was limited by the number of Hispanic college students who were accessible and attending state institutions in North Carolina. The number of Hispanic students varied from campus to campus, but was between 3 and 5% of the

undergraduate student population at the time of the study. Access and return rate variability produced a limited sample size.

Compounding the sample size limitation was the method of relying on the campus coordination in the volunteer distribution of the instrument. Each campus had its unique challenges and protocols. While one campus was able to e-mail a link to the survey directly to a pre-generated list, other campuses were prohibited by either policy or practicality, from doing so and the instrument was delivered via campus list-serve or class e-mail.

Additionally, the study was based on a volunteer sample and thus could have produced a number of compromising aspects to the results, including responses biased on social-economic status, race or other unknown or unstudied variables. The general population samples collected from list-serves and class lists were particularly troublesome as members of samples generated from these sources shared a common experience in terms of either the class or list-serve topic interest. Race and socio-economic class were not studied. Race was excluded because of the confusing aspects it shares with ethnicity. Socio-economic class was excluded because it was beyond the scope of this study to identify the many contributing factors and affects of the concept. Neither of these exclusions affected the results of the primary variables being examined.

Finally, as data from each instrument was taken from an on-line survey with no IP address or other identifying feature collected, the study could include repeat responders and false, or “fake” responses that could have impacted the results.

Data Gathering and Methodology

Utilizing the Index of Learning Styles (ILS) developed by Richard Felder and Barbara Soloman (1991), learning style preferences were gathered from a general population and compared to those preferences of participants reporting Hispanic ethnic identification.

Using specifications and approval spelled out by instrument author, Felder, the Inventory of Learning Styles, ILS, was modified to include items related to ethnicity and gender, Appendix C. Racial identity was not asked because this item could have been confusing to participants. The Federal government recognizes one ethnicity for persons of Hispanic descent and notes there might be a racial component to Hispanics but it is neither identified nor defined (Hispanic-American Families - The Hispanics/Latinos and Group Definition, 2009).

The instrument itself was distributed via an e-mail web link to a sample of Hispanic students and a sample of general students attending four campuses within the University of North Carolina system. This was done in coordination with campus representatives and the research protocols for each campus. This e-mail contained a link to a “Survey Monkey™” version of the ILS (“Survey Monkey™” is an online data collection tool operated by SurveyMonkey.com LLC in Palo Alto, California). The participants completed the form and submitted it through the “Survey Monkey™” site, Appendix A. In order to optimize return rates a “four contact model” of administration was followed (Dillman, 2000, p. 177). The model entailed a follow-up procedure after the initial administration which included a second contact in the form of a “Thank you”

or reminder. Then a third contact which was similar to the first administration. A fourth and final contact emphasizing the importance of the research followed (p. 178).

Once submitted each form was collected in a spreadsheet. In accordance with pre-set options in “Survey Monkey™” which allowed the researcher to turn-off IP address collection, no identifying information of respondents and no reference to identifying information from sender were collected.

The data contained in the “Survey Monkey™” collection was uploaded into a Microsoft Excel spread sheet where formulas were added to score the items according to specifications from Felder and Soloman (1991). The items were sorted and scored according to each of the four dichotomous dimensions of the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal, Sequential/Global. Each individual instrument was scored on each of the dimensions so that a total dimensional score for each participant was calculated. These scores were placed on a Dimensional Scale using guidelines outlined by Felder and Soloman (1991). The scores were then analyzed using Pearson product-moment, MANOVA and ANOVA, to look for correlations between and differences among learning preferences based on ethnic identity.

Prior to administration, a pilot study was done using similar procedures on a smaller sample size (the study utilized “Google Forms” as opposed to Survey Monkey™. Through the pilot study, “Google Forms” was found to be less stable than desired which prompted the move to Survey Monkey™.). The purpose of a pilot study was to insure the instrument, instructions and procedures worked as intended (McMillan & Schumacher, 2006, p. 235). The pilot study for this research included items related to the

completion time, understanding of the instrument, the efficiency of the administration method, and the practicality of the data collection method.

Significance

Aligning a quantitative value to the learning experiences and styles of Hispanic students will give educators an opportunity to develop methodological strategies for educational activities, services and environments to meet the growing needs of this population. As time passes, the population expands and generations acculturate there will be social pressure to become stratifiably mobile, to move up the socio-economic ladder (Portes & Bach, 1985, p. 23). Portes and Rumbaut (2001) note the importance of education as a function in this process (p. 282). Factors such as access, motivation, and support play important roles in the ability of immigrant success educationally and socio-economically, both individually and collectively (p. 283). This study highlighted differences of learning styles between Hispanic and non-Hispanic learners. This information could be utilized to gather data on appropriate pedagogical and methodological strategies to address the learning needs of the Hispanic population who attend state-funded, or “public,” post-secondary education.

Pascarella and Terenzini (1991) noted that “developmental movement originates in a challenge to the current state of development” (p. 45). This idea was echoed by Mina, Cabrales, Juarez, and Rodriguez-Vasques (2004) as they described how understanding and motivation provided by Hispanic staff and faculty inspired them to succeed in their higher education endeavors and become educators themselves (p. 86). The concept of addressing students on their own level to move them further developmentally is additionally echoed by Felder and Henriques (1995) as they suggested

a multi-style approach to education (p. 28). They noted that an instructor will usually be teaching in a style that is preferred by several types of learners. Balancing this with strategies that employ variations of presentations and use of inductive and deductive techniques in a manner that is comfortable for the instructor and effective for students can greatly enhance the results of all learners in a class (p. 29). Some researchers have attempted to justify one pedagogical method over another based on learning style theories, e.g., Bergsteiner and Avery (2008). However, the majority of the research suggested that understanding the learner's style is the key to educational planning and success in trans-cultural learning environments (Felder & Henriques, 1995; Manikutty, Anuradha, & Hansen, 2007; Reid, 1987; Sanchez, 2000).

Summary

The population of persons who ethnically identify themselves as Hispanic is growing in the United States. Research has shown that ethnic identity can have a profound impact on student development and success (Hernandez, 2000; Pidcock et al., 2001; Sanchez, 2000). This research was conducted to determine if there are relationships between and/or differences among learning style preferences in undergraduate college students based on ethnic identity. Although other research has noted qualitative differences in the perception of higher education and higher educational environments based on cultural and ethnic differences; and how these perceptions and perspectives impact a students' experience; to date a quantitative analysis on learning preferences has not been conducted (Bohon et al., 2005; Gonzalez et al., 2004; Hernandez, 2000; Pidcock et al., 2001; Rendon & Valadez, 1993; Vasquez, 1998; Sanchez, 2000).

The researcher used quantitative methods to study learning styles of undergraduate students from four state universities in North Carolina. Additionally, the interaction and variances of gender differences with ethnic identity was also studied.

Historically research on learning preferences, personality development, and learning style measurement has a rich history in psychological research, including the writings of Freud and Jung (Hawk & Shah, 2007; Kolb, 1984; Kolb, Rubin, & MacIntyre, 1971; Swanson, 1995). However, the refinement of the research to focus on cultural influences is relatively new and scattered at best (Entwhistles & Ramsden, 1983; Felder & Henriques, 1995; Glick, 1975; Gonzales & Roll, 1985; Gradman & Hanania, 1991; Hofstede, 1986, Lesser, Fifer, & Clark, 1965; Witkin, 1976). Furthermore, research on Hispanic ethnic identity has only surfaced in the past 20 years (Gonzales & Roll, 1985; Ramirez & Castanenda, 1974; Reid, 1987). The following chapter will present research related to the Hispanic educational experience, successful practices, learning style measurements, and cultural differentiation in learning giving a back-drop from which this study can be understood with more clarity.

Chapter 2

Literature Review

The purpose of this study was to determine if there are discernable, quantifiable differences of learning styles for undergraduate Hispanic students as compared to non-Hispanic undergraduate students. The study quantifiably categorized learning preferences using Felder and Soloman's (1991) Index of Learning Styles, or ILS. The ILS was designed to assess preferences across four dimensions or domains: active/reflective, sensing/intuitive, visual/verbal, and sequential/global (Felder & Soloman, 2001, pp. 1-4). Analysis on the categorized learning styles was conducted to look for significant relationships between learning style and ethnic identity. Further analysis was done to look for interaction effect in relationships and differences of learning styles based on ethnic identity and gender. This information was utilized to make recommendations on methodological strategies for educational activities, services and environments that address the learning needs of the Hispanic population who attend state-funded, or "public," post-secondary institutions.

A review of the relevant research indicated significant aspects of the higher education experience unique to Hispanic students. These differences were seen as cultural, familial, socio-economic and learning centered. This review is organized by first highlighting these unique experiences, then flushing out the challenges resulting from these experiences, and finally presenting evidence of successful practice.

Additionally a review of literature surrounding learning styles and learning style theory was needed to help define and measure learning preferences. This review

included both general information on learning style theory and differentiations noted in cross cultural studies.

The Unique Hispanic Higher Education Experience

Bohon et al. (2005) conducted in-depth interviews with 68 key individuals working with the Hispanic population and focus groups with 103 Hispanic participants in Georgia (p. 46). They found that obstacles created by both latent and overt ethnic stratification in American society reduced the Hispanic students' chances of high school graduation, college enrollment, and socio-economic mobility. They highlighted six distinct barriers to educational attainment: (a) lack of understanding of school systems and educational culture, (b) inadequate parental involvement in schools, (c) lack of residential stability, (d) lack of school support for personal and cultural needs, (e) lack of or misunderstanding incentives for continuation of education, and (f) lack of eligibility for college and/or financial aid for college (p. 48). They noted that major systemic change in educational philosophy and practice are needed to address the social and cultural needs of a rapidly growing Hispanic and immigrant population. These changes would need to account for cultural and language barriers, economic concerns as well as the educational levels of parents and other family members.

Similar findings were recorded by Rendon and Valadez (1993) as they utilized in-depth interviews with college administrators; college president, chief academic officer, director of institutional research, director of admissions, director of financial aid, selected special support services staff, and selected faculty members at community colleges in six Southwestern states, for a total of 42 interviews (Methodology, ¶2). The institutions were Arizona Western College (AZ), Cochise College (AZ), Imperial Valley College

(CA), Southwestern College (CA), Laredo Junior College (TX), Texas Southmost College (TX). The researchers used these interviews to gain a perspective on policies and practices which enhance or impede Hispanic student transfer from the community college to four year institutions (Rendon, Manuel, & Resta, 1988, p. 25). The interviews were done as part of a larger study for the Ford Southwest Transfer Education Research Project by Rendon et al. in 1988. By coding and clustering the data, they identified five themes influencing the continuation of education by Hispanic students: (a) importance of family, (b) economic considerations, (c) knowledge of the system, (d) cultural understanding, and (e) relationships with feeder schools and four year institutions (Findings, ¶1). The researchers noted that 4 of the 5 themes are related directly to the family of the student, and 3 of the themes relied on the family's knowledge and acceptance of American educational and vocational systems. Misunderstanding of these systems can become obstacles for Hispanic students as they attempt to further their education instead of working to support a family's economic needs, or attempt to attend a college in a geographic locale different from that of the family. Further obstacles can appear as a result of pedagogical philosophies which do not take cultural differences into consideration (Discussion, ¶3).

Mina et al. (2004) used phenomenological narrative to show how family, community and institutional partnerships can be utilized in evidence based practice for academicians and administrators looking to improve success of Hispanic students. The authors were Hispanic and used a narrative format to explain the Hispanic undergraduate experience through their personal experiences. Jose Cabreles attended Santa Clara University and explained his decision to attend the institution as well as the influences

that led him to that decision and his family's acceptance of this choice (p. 80). Cynthia Juarez attended the University of Texas-El Paso. She explained her experience at this institution which is 70% Hispanic (p. 81) and how her experiences with student affairs professionals influenced her development (p. 83). Fernando Rodriguez-Vazquez described his journey from his neighborhood in Watts through East Los Angeles College to San Diego State University and how membership in a Latino Greek organization allowed him to feel a sense of comfort and camaraderie that gave him motivation and confidence to finish his schooling (p. 85). Lilianna Mina explained her decision to attend college over a hundred miles away from her Detroit home and how Latino staff helped give her the confidence to become an Academic Advisor at Michigan State University and to help others as those before her had assisted her (p. 86). Although the personal narrative format, in which researcher and subject are the same, gave the piece an overly subjective slant, the narratives offered great insight into the Latino educational experience from educators who experienced it firsthand. The researchers all spoke of how cooperative relationships between constituents who had an interest in their success played a valuable role in that success (p. 87). Their primary recommendation to faculty and student service professionals was to gain an understanding of Hispanic values, utilize opportunities for involving individual students in the daily life of the university, and truly make them a part of the college experience (p. 88).

In order to truly involve and encourage success of Hispanic students we need to have an understanding of who they are and how they learn. Vasquez (1990, 1998) used participant interviews and observation to discern the distinctive qualities of Hispanic learners and contrast them to other students. The researcher highlighted the Hispanic

learner's distinctive loyalty to family contrasting it to the "rugged individualism" of the Euro-centric family (Hispanic Students, ¶ 2). Hispanic students have responsibility to the family to do well and success is reflective of honor for the family (¶ 3). This concept shifts motivation towards others and away from the self as compared to the self promotion encouraged in the traditional American student who is taught that they can go as far as they want and will only have themselves to blame or thank (Elleson 1983; Kagan 1972 as cited in Vasquez, 1990, Hispanic Students, ¶ 3). Vasquez also noted that this motivation towards others carries over into a desire to be in more cooperative learning environments as opposed to the competitive environments common to traditional classrooms (Hispanic Students, ¶ 2). Finally, he spoke about the need for role models for Latino and Hispanic students, and lamented the obvious lack of such persons in political, business and educational leadership positions (¶ 4). He explained how pedagogical constructs can be altered utilizing a process of addressing the content, context and mode of learning in a culturally sensitive manner, e.g., choosing to inform students' family of achievements, providing opportunities for group work, and utilizing people-centered teaching rather than object-centered (Adapting to Cultural Traits, ¶3).

Hernandez (2000) conducted a series of in depth interviews with ten Hispanic students who had either recently graduated or were graduating seniors in college. Diversity with respect to gender, country of origin, academic major and transfer status were all maximized through a maximum variation sampling procedure as opposed to random sampling. The study sought to find the factors that influenced the retention and graduation from college of the Hispanic students, and what meaning the students placed on these factors. The researcher used interviews and focused exploration of the campus

environment to retrieve the data. Although the sample size was limited, Hernandez's information is both thorough and useful in terms of understanding a campus environment from a Hispanic student's perspective. The article cataloged eleven themes and influences associated with retention. The themes were as follows : (a) Internal motivation: "I want to do it.," (b) Family, (c) Friends, (d) Peers, (e) Faculty and staff, (f) Co-curricular involvement, (g) Latino community, (h) Environmental adjustments, (i) Equating of environment and people, (j) Personal experiences, and (k) Involvement as a method to understand environment (p. 579). Hernandez theorized it is the connection between these attitudes, abilities and relationships that contribute to the subject's retention, persistence and graduation (p. 579).

Although research by others, Rendon and Valadez (1993) and Vasquez (1998), have highlighted how the family, specifically, and people, in general, play an important role in a student's success. The "I want to do it!" attitude that Hernandez (2000) spoke about seemed to have the most profound impact because of its relationship with all other factors (p. 583). This attitude is described as a realization that the students possessed the potential to succeed (p. 579). In many respects this attitude is a combination of self-efficacy, motivation and esteem, and appeared to be "the driving force behind the participants' belief in themselves" (p. 579).

Educational experience will vary from individual to individual. However, the cultural norms a student has internalized can influence this experience (Manikutty et al., 2007; Sanchez, 2000; Vasquez, 1998). Although research varied in methodologies there are commonalities among students of Hispanic descent (Bohon et al., 2005; Mina et al., 2004; Rendon and Valadez, 1993). Chiefly among these was the influence of family.

Family influences everything from how far a student will take their education, what institution they will attend and what they will study (Mina et al., 2004; Vasquez, 1990, 1998). Closely related to family is community, Hispanic students will seek out a community with similar values and beliefs to create a support system (Hernandez, 2000; Mina et al., 2004). As part of this support system extra value is placed on faculty and staff who can be seen as role models and who understand the culture (Mina et al., 2004; Vasquez, 1990, 1998). Finally, communication becomes a key component (Bohon et al., 2005; Rendon & Valadez, 1993; Vasquez, 1990, 1998). Communication in all aspects, from institution to family, from teacher to student, and peer to peer, affected how a student processes the environment and how they view their experience. Ultimately, these factors will determine if they are successful. The uniqueness of these influences and their universality among Hispanic students result in inherent challenges to educators. In the following section, this paper will highlight some of the more poignant challenges as cited in the research.

Challenges

Factors that contributed to the experiences associated with the success and failure of Hispanic college students are both internal and external in nature. Internal factors included self-concept, motivation, and socialization (Kenny & McEachern, 2009; Padilla, 2006; Pidcock et al., 2001). External factors included cultural norms, economic, and environmental barriers (Gonzalez et al., 2004; Hurtado & Ponjuan, 2005; Nora & Rendon, 1990; Wassmer, Moore, & Shulock, 2004). Each factor has a significant influence on a student's choice to continue his or her education and their ability to succeed in their efforts to do so. The following is a review of literature highlighting the

significance of these factors as both evidentiary and predictive contributors to academic success.

Beginning at a young age self-concept is molded by cultural and biological factors; everything from how we physically look to how we socialize is affected by this cognitive picture of ourselves (Kenny & McEachern, 2009, ¶3). Kenny and McEachern (2009) sampled 214 fourth and fifth graders from a large school district in South Florida to look at the impact of ethnicity on self-concept. The sample was divided ethnically with 60% Hispanic, 23% Black-Haitian/American, and 17% White Non-Hispanic (Participants, ¶1) Using an instrument named the Piers-Harris Children's Self-Concept Scale (Piers and Herzberg, 2002) Kenny and McEachern (2009) found that ethnicity was a significant factor in self-concept. Of note was the fact that the Hispanic and Black-Haitian students had lower behavior scores than did the Caucasian students; the Caucasian students perceived themselves as “complying with rules and expectations” more than did the other two groups (Discussion, ¶1). This study was limited by sample size and geographic confinement, South Florida is a unique multi-cultural environment (Limitations, ¶1). Nonetheless, this study presented substantial evidence as to the influence of ethnicity on the individual psyche and group perceptions.

Padilla (2006) reviewed literature on the influence of ethnicity on social development and the slow assimilation of Hispanic and Latino populations in areas of high immigrant populations; California, Texas, New York, Florida, New Jersey and Illinois (p. 468). Padilla surmised that demographic changes and generational differences have added complexities to the way society viewed immigrant populations (p. 494). The influence of ethnicity has become more complicated while the weight and importance of

ethnicity has become more pronounced in how Hispanic persons assimilate, adjust and deal with the prejudices of the multi-cultural environment existing in the United States (p. 494). Padilla theorized that ethnic identity has become an important coping mechanism in making sense of an environment that has cultural diversity, on one hand, but produces a self-concept as an “outsider” on the other (p. 468). Such is the situation for many Hispanic adolescents at the time of this study (p. 468).

These internal self-concepts may be articulated in the practical differences in experiences that are culturally biased. Using analysis of variance and chi-square analyses Pidcock et al. (2001) examined familial, behavioral and retention differences between Hispanic first-year college students and their non-Hispanic counterparts. The study sampled 201 students, incoming freshmen at a college in the Southwest, of which 78 responded (23 Caucasian females, 16 Caucasian males, 28 Hispanic females, 8 Hispanic males, and 3 other). Hispanic students were shown to be more at risk for problems in family and social experiences and less likely to have a mentor (p. 811). However, they also found that Hispanic students were less likely to experience problems related to drugs and alcohol in the first semester of college (p. 810). The small sample size coupled with a regional bias of the Southwest does limit the generalizability of the study. However, the findings were important as we gain greater insight into the picture of persistence for Hispanic college students.

Gonzalez et al. (2004) used life history interviews to report on the “challenges and sacrifices” faced by Hispanic women admitted to tier 1 universities, or those universities with a prominent research component (p. 19). Beginning in 2000 the researchers spoke with two groups of participants, both groups attended public schools, and were from

working class environments in California. One group was characterized as entering one of two of the “most highly selective universities in the nation” after completing k-12, the other group characterized as entering California’s most selective state flag-ship University after some community college experience (p. 19). Their interaction with these students led them to argue that a desire for independence was a primary motivator in their decision to go away to college (p. 20). They noted, however, that this desire for independence was at odds with a cultural belief system that “women were unable to take care of themselves” (p. 21). Tensions revolving around this belief were eased for the family of students through gaining a perception that culturally explicit support systems existed for these women, such as culturally oriented student organizations, culturally sensitive staff or strong cultural community presence on campus (p. 22). Despite the desire for independence, this tension crept into the consciousness of the students over time. Essentially, Hispanic students in this study reported having an easier time making the decision to leave home than to stay away from home (p. 24). The authors posited that the students in the study were in a state of transformation as they synthesized the values of family and interdependence of the Hispanic community and the individuality and independence that is encouraged in academia.

Using a direct discriminate function analysis, Nora and Rendon (1990) examined the relationship of gender and ethnicity to math and science preparation in non-Hispanic Caucasian and Hispanic students from six community colleges in the region along the Mexican/United States border, from California to Texas. Their purpose was to find the best combination of predictor variables which maximize the difference between Hispanic and Euro-descendant community college students in their math and science course-taking

behavior and achievement. They surveyed 397 students from a total student population of 1,615 assessing socioeconomic and demographic status, attitudinal, college and pre-college variables. They found that the most significant factor in the separation of the groups of students was parental educational background (Results, ¶5-8). They further noted that most Hispanic students had parents without even a high school diploma (Discussion, ¶1). Although they noted that some Hispanic students overcame this variable, they argued that the data reinforced the existence of socioeconomic inequities between non-Hispanic Caucasians and Hispanics. Although this study highlighted significant disparities, its relevance is limited due to the time and geographic area from where the sample was taken. This limitation is highlighted in the study's comparison of a defined ethnicity, Hispanic, and a defined, race, Caucasian. This difference is highlighted by the United States' definition of Hispanic ethnicity as not necessarily having a racial component (U.S. Census, n.d.b).

As the previous studies focused on factors external to school itself, Hurtado and Ponjuan (2005) took a different approach looking instead at the factors in campus climate as they relate to Latino educational outcomes (p. 236). The researchers defined campus climate using a framework developed by Hurtado, Milem, Clayton-Pederson, and Allen (1999) in which the environment of diversity is shaped by four factors: (a) historical legacy of inclusion or exclusion of groups, (b) the structural diversity or numerical representation of diverse people, (c) the nature of interactions among diverse groups, and (d) individual perceptions of the environment (p. 236). The project was a longitudinal study with 370 Latino students across nine public university campuses in varied geographic locations who responded to surveys in both the first and second year of the

project. The first survey was administered during an orientation class during the students' first year, and the second year survey was administered in multiple settings both using electronic and hard-copy administrations (p. 238). The nine campuses had shown commitment to diversity and had recent success with diversity programs. In the first analysis the researchers looked at the characteristics and experiences of Latino students who "perceive a hostile climate towards diversity," they showed no significant differences in ability, gender, socioeconomic status, generation or the first in the family to attend college (p. 243). However, students who spoke Spanish at home perceived a more hostile environment (p. 244). Also perceiving a more hostile environment were students who reported positive interactions with diverse peers (p. 244). The second analysis measured a Latino student's sense of belonging in the college environment, a factor shown to be critical in other research (Hurtado & Carter, 1997). Variations in Latino background were not shown to be significant in students' sense of belonging compared to college experiences. However, students living on campus or with parents tended to have a higher sense of belonging than students who lived off campus (p. 245). The authors theorized this is due to important factors of peer and familial support (p. 245). Also noteworthy, students who reported higher levels of positive interactions with diverse peers were also more comfortable and those that perceived a negative climate for diversity were less comfortable. The finding that students who reported positive interactions with diverse peers perceived a more hostile environment (p. 244) was particularly interesting. Authors theorized that "students who have achieved intergroup relations skills tend to recognize tension, stereotyping, and treatment based on group identities in predominantly White environments" (p. 148).

Whereas the community college has played a significant role in Hispanic Higher Education to this point (Laden, 1992; Nora & Rendon, 1990) the transference to the baccalaureate level has not come to fruition. Wassmer et al. (2004) used student cohorts from 1995-96 and 1996-97 to develop institutional aggregates characteristics of factors affecting both six year and three year community college transfer rates to four year institutions for 81 California Community Colleges (p. 656). The results showed that colleges with higher percentages of both African-American and Hispanic students had lower transfer rates to four year institutions (p. 664). Although the limitations of institutional level data precluded micro-level understanding of the factors involved in student transfer rates, socio-economic and cultural factors, the project did highlight the importance of addressing the education of students of Hispanic descent from elementary through baccalaureate levels, and the environment in which this education takes place.

As the population of Hispanic American students increases, educators must find strategies which effectively account for the Hispanic experience and address the challenges presented above. The following section will present programs, practices and theories which are aimed at increasing retention and graduation of Hispanic students in higher education. The literature presented here explored both the societal and environmental factors affecting successful practices in education that could benefit the Hispanic community in both the community college level and beyond.

Successful Practice

Community College. The community college is the gateway through which many Hispanic students enter their experience with higher education (Laden, 1992, p. 1). Issues of persistence and retention revolved around these first experiences and whether a

student will decide to continue his or her education (Laden, 1992; Nora & Rendon, 1990).

In 2002, Cejda, Rhodes and Casparis conducted a study on factors that lead Hispanic students to attend and persist at Hispanic Serving Institutions, HSIs. The study was a multiple case study design using 30 students from three institutions identified by the U.S. Department of Education as HSI's and having a Full Time Equivalent student population of self-identified Hispanic/Latino population between 25 and 90% (p. 7). They categorized factors into two themes, those associated with the family and those external to the family (p. 10). Factors associated with family were support and encouragement of family, wanting to be a good role model for children, and the desire not to repeat mistakes of negative role models (p. 12). The other category, factors outside the family, included high school faculty, community college faculty, community college staff and peers (p. 14). Of the people involved with these factors family members, college faculty and peers had the most profound influence (p. 15). The researchers admitted this study had limitations in that it was only an initial attempt to gain a broad understanding of the people who influence Hispanic students in a most general sense; however, the insights gained were informative. As noted in other studies, the influence of family and peers were not surprising (Vasquez, 1990, 1998; Mina et al., 2004). However, the emergence of college faculty as a major influence was important as this factor pointed to the role faculty had in persistence. Only 17% of respondents had talked with faculty prior to enrolling yet 86% reported having been influenced by faculty (Cejda et al., 2002, p. 15). Cejda and Rhodes returned to explore this influence in more depth in their 2004 study.

The 2004 study by Cejda and Rhodes explored the role that faculty played in leading to Associate Degree completion by Hispanic students at the community college level. The study was a qualitative approach using a case study methodology for interviewing faculty at a suburban Texas community college with a student body self-identifying as Hispanic of 39.7%, and a faculty doing so at less than 5% (p. 252). The institution had been identified in the 2002 Cejda, Rhodes and Casparis study mentioned above and had shown a high degree of faculty influence on students' decisions to attend and persist. The major themes that came from this study showed that transfers of credit and access to baccalaureate programs are barriers to continuing beyond the Associate of Applied Science degree (p. 254). Additionally, the sub-baccalaureate credential creates a primary entry port for Hispanic students due to lower academic restrictions and increased employment potential (p. 255). Once in college, the idea of career advancement and potential for income earnings could be motivators in persistence (p. 257). Finally, mentoring is a key to retention. Effective relationships can begin with the recognition to identify and encourage signs of success, including the ability to communicate with faculty and peers (p. 256). Although this project was limited in scope by the low number of participants, three faculty, the nature of its regional and academic setting, the findings do provide weight to the notion that faculty play a significant role in the success of the Hispanic student (p. 259).

Laden (1992) used structured interviews with college personnel at a San Francisco area community college with high transfer rates of Hispanic students to four year colleges to explore the organizational factors affecting those rates. The interview questions focused on the community college's efforts to increase transfer of Hispanic

students as they and the intensity of programs related to Hispanic student transfers, the increase of those transfers, and the increase of transfers of under-represented students (p. 5). Laden's observations pointed to the public commitment of the President of the college toward increasing transfer rates of underrepresented populations at the College as the most pronounced influence on high rates. This commitment led to a college culture which supported efforts through administrative functionality. However, budget constraints and personnel issues often thwarted even the most well meaning programs based solely on transfer agreements (p. 24). Laden argued, for continued success of transfer programs of Hispanic and other underrepresented student populations, commitment must be to programs which go beyond simple agreements and encourage, nurture and support students through all phases of the transfer process: admittance, retention and transfer (p. 29).

Later, in 1998, Laden analyzed the Puente Project, a California program partnering community colleges and the University of California for the benefit of transferring Hispanic students. Using semi-structured interviews with faculty, administrators and Puente Project staff, Laden highlighted the idea of "celebratory socialization" to reduce the culture shock of college in students of Latino descent (p. 5). Examining organizational responses and socialization practices she noted that the students involved in the project gained "pedagogical and transformative experiences" that raised their academic and professional goals, and perhaps more importantly, their self-esteem and cultural pride. She also noted that a significant component of the project was its ability to move students from high school, through community college and university toward business and career. She augmented the interview data with empirical data

showing a 97% retention rate for community college students involved in the project, and transfer rates of 86% continuing at either the University of California system or California State Universities (p. 14).

The successful practices above were reiterated in Cejda and Hoover's (2009) study of programs that facilitated success with first-generation Hispanic students. The researchers used multiple case study design in their examination of how community college faculty created positive educational environments for their students (p. 7). The study interviewed 41 faculty and staff from 3 institutions. These institutions were referred to in a descriptive sense as "Rural Community College," a rural multi-campus institution serving 25 counties with a growing Hispanic student population of 7% (p. 7); "Suburban Community College," a Hispanic Serving Institution (HSI) serving 2 counties in a major metropolitan area (p. 7); and "Urban Community College," also a HSI serving a large metropolitan area (p. 8). The study highlighted the challenges facing the first-generational students including family obligations, academic unpreparedness, and distrust of the educational establishment (p. 11). Respondents emphasized the importance of the community college in meeting the needs of Hispanic students due to its emphasis on teaching and learning and its flexibility to adapt to the needs of its students (p. 15). They reported that successful strategies developed a constructive relationship that was able to relate learning to personal experience (pp. 18-19). Furthermore, they felt it was important to incorporate activities that played to student preferences to work cooperatively and engage in active learning processes and receiving personal feedback (p. 19). To accomplish this they suggested utilizing strategies that created natural learning

support systems that were culturally enhancing and celebratory (p. 18, 20); strategies like Tinto's Learning Communities (1997) and Laden's celebratory socialization (1998).

The following section will review literature on how structuring learning environments like those described here for community colleges can have a positive effect on Hispanic students in other educational settings as well.

Shaping the Educational Environment. Torres (2006) examined retention models and Hispanic students. Using a concurrent nested strategy to gather quantitative and qualitative data Torres used semi structured epistemological interviews to gather themes that were measured against current theoretical models of retention. Respondents were 541 students from 3 urban institutions, two of which were identified as Hispanic Serving Institutions (HSI) and the third as a predominately non-Hispanic environment (p. 302). Twenty-two of the original respondents were interviewed as part of the mixed method design. Instead of focusing on structures or deficiencies which prohibit student success, this study focused on the adaptations students were able to make to be successful, and the influences on those adaptations (p. 310). Torres noted the importance of students creating cognitive maps of the college environment. Educators can assist in this endeavor by avoiding practices that placate to or disavow a student's relationship with their cultural values (p. 316). A more useful strategy would be to put mechanisms in place that would assist a student in modifying those relationships in a way that benefited the student in the future.

Sanchez (2000) advocated for environments which take advantage of the cultural propensity for community found in Hispanic learners by utilizing community-centered learning environments. As a basis of this premise she used her own study from 1996. In

the study Sanchez compared learning style preferences of 240 Hispanic students utilizing a theoretical construct which evaluated motivational maintenance, task engagement and cognitive strategies (Curry, 1991, New Theoretical Model ¶1). The researcher found Hispanic students to be participation oriented, collaborative, and concrete in their learning motivation, reflective with an active interest in learning as they engage in learning tasks, and showed a preference for using experimentation and judgment over perception in their cognitive strategies (p. 42). Although Sanchez warned about the dangers of developing stereotypes based on these profiles, she noted that learning communities like a shared knowledge learning community described by Tinto provided support and engagement that encouraged both group and individual success.

Tinto (1997) used a mixed methodology including participant observation, interviews and document review to analyze a Seattle community college's effort to change the classroom environment. The resulting effort was described as a learning community which used collaborative learning strategies (p. 600). Tinto further stated that these manufactured educational environments which fostered involvement positively affected student effort and persistence (p. 615).

In 2004 the Pew Hispanic Center and the Kaiser Family Foundation conducted a national phone survey sampling of 3,241 people. Of those interviewed 1,508 identified themselves as Hispanic or of Latino descent, this sample was categorized as native born and foreign born or immigrant (p. 2). The study highlighted the complexities of perspectives held by respondents in both groups. While both have confidence in the American educational system they worry about its inability to bridge cultural gaps. Both groups also agreed that the teaching of English was essential to success. However, most

participants indicated that they would like to see programs which supported a student's native language as well (p. 3). This was especially true for those in the foreign born group (p. 3). Foreign born respondents also reported being in stronger favor of affirmative action in University admissions, while native born respondents were more likely to feel strongly about school integration (p. 21).

Learning Styles Research

Learning Style Theory. Learning style theory had its basis in Jungian psychology and the cognitive development theory of Jean Piaget. However, the general field became prominent as a component of the personality type research of Katherine Briggs and Isabel Briggs-Myers in research with the Myers-Briggs Type Indicator first published in 1962 (Swanson, 1995, p. 5). Additionally, David Kolb's Learning Styles Inventory, LSI, stemming initially from his work on a text, "Organizational Psychology: An Experiential Approach" first published in 1971 along with co-authors Irwin Rubin and James McIntyre. The theory and instrument were later refined and presented in Kolb's own book *Experiential Learning* (1984), where he defined learning as a process of creating knowledge from the transformation of experience (p. 41). Also, noteworthy is the work of Dunn, Dunn and Price on their "Productivity Environmental Preference Survey," PEPS, first available in 1982 and later refined in the Dunn and Dunn Learning Style Inventory produced in 1989 (Hawk & Shah, 2007, p. 9).

In comparative studies of learning style theories three distinct models of learning style tools have been identified; those associating learning as a component of personality, those that measure cognitive associations and those that combine or layer the two (Felder & Spurlin, 2005; Hawk & Shah, 2007; Reid, 1987; Swanson, 1995).

The Myers-Briggs Type Indicator, MBTI (1962), is an example of an instrument that measures learning styles as a component of a larger personality profile. Basing its premise primarily on Jung's psychological types, the MBTI delineates people using four groupings and eight categories. People may either be, introverts or extroverts; sensing or intuitive; thinking or feeling; judging or perceiving (Myers & McCaulley, 1985). Each grouping contrasts opposite traits, extroverts are attentive to the interactions in the world outside of themselves and are socially focused while introverts focus inwardly and are more contemplative. In the sensing and intuition dichotomy one can see the preferences for processing information (p. 35). Sensors, rely on their senses, preferring concrete facts organized material and crave structure in their learning (p. 35). Intuitors, on the other hand, are more theoretical and creative in the way they process information and using their intuition (p. 35) (see Figure 1).

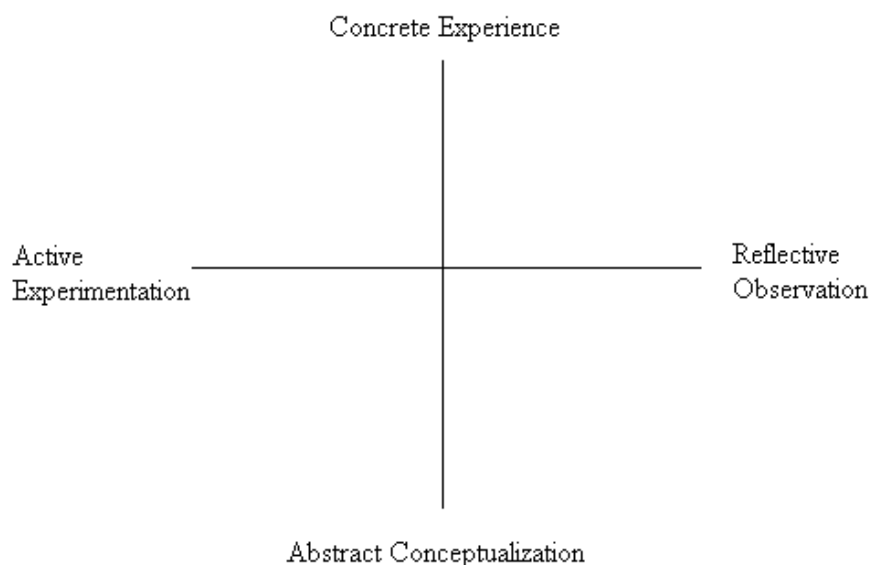
Sensing (S)		Intuition (N)			
Thinking (T)	Feeling (F)	Feeling (F)	Thinking (T)		
ISTJ	ISFJ	INFJ	INTJ	Judgment (J)	Introversion (I)
ISTP	ISFP	INFP	INTP	Perception (P)	
ESTP	ESFP	ENFP	ENTP	Perception (P)	Extraversion (E)
ESTJ	ESFJ	ENFJ	ENTJ	Judgment (J)	

(Adapted from Myers-Briggs Foundation. 1962, *MBTI Basics*, ¶12)

Figure 1. Myers-Briggs Type Indicator (1962).

Kolb's (1984) theory takes the notion of a cognitive processing dichotomy and shows a preference for not only the way people take in new information but also how

they internalize it, processes he referred to as grasping and transforming (p. 41). Much like the MBTI, Kolb's instrument sought to find preferences for either concrete experience or abstract conceptualization for the way a person takes in information, Kolb referred to these as the prehension dimension of learning (p. 74). He then added a new dichotomy for internalizing, the information, or transforming, in a measure for preferences for active experimentation or reflective observation (p. 74). The combination of these preferences produced four distinct manners of cognitive associations or learning styles, Concrete Reflective, Abstract Reflective, Abstract Active, and Concrete Active (p. 76) (see Figure 2).

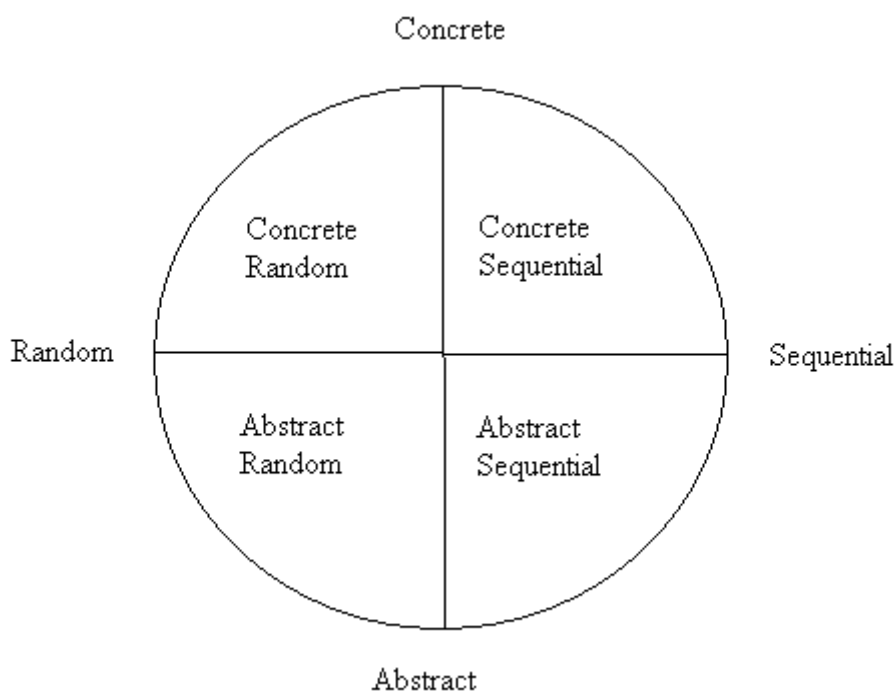


(Adapted from Kolb, 1984, p. 70)

Figure 2. Kolb's (1984) learning styles.

Another notable model is Gregorc's (1982) "Style Delineator Model" focused on Kolb's cognitive features, Abstract and Concrete (Terry, 2002, p. 157). Gregorc further

described two dimensions based on information ordering, random and sequential (p. 160). Similar to Kolb, the combinations of these components depicted four learning styles (p. 161), Concrete Random, Concrete Sequential, Abstract Random, and Abstract Sequential (see Figure 3).



(Adapted from Terry, 2002, p. 158; Butler, 1987, p. 16)

Figure 3. Gregorc's (1982) style delineator model.

Flemings (2001) Visual Aural Read/write Kinesthetic, or VARK Model related learning to communication. The model got its name from the manner in which people take in and present information, namely Visually, Aurally, Reading/writing, and Kinesthically (The VARK Catagories, ¶1). Fleming suggested that preferences in these components create profiles that are either more rigid or adjustable (Frequently Asked

Questions, ¶ 6). Fleming noted that student performance is enhanced when learning activities can be matched to learner profile preferences (Frequently Asked Questions, ¶ 16).

The Felder & Silverman Index of Learning Styles (1988) utilized a combination or layered approach to capture the most important learning style differences (p. 675). Initially created as a tool for engineering instructors to address learning needs of their students, the instrument's acknowledged tie-in to pedagogical practice and its cross theoretical dimensions make the instrument one of the more complete models. Similar to the before-mentioned models, Felder and Silverman utilized five dichotomous dimensions:

1. The sensing/intuitive dimension of the MBTI.
2. The Active/Reflective dimension utilized in Kolb's theory.
3. Auditory/Visual, similar to Fleming's VARK mannerisms. This dimension was later changed to Verbal/Visual thus allowing for both written and spoken words in the same dimension (Author Preface, 2002, p. 1).
4. Sequential/Global the authors suggested has many analogs in other models including Gregoric (2005).
5. The fifth dimension Inductive/Deductive was dropped in the later version of the Index of Learning Styles (Author Preface, 2002, p. 2).

The ILS was developed more recently than some of the other instruments and its relative newness does come with the burden of less research available to judge the instrument's validity and reliability as compared to those utilized by the Dunn and Dunn or Kolb (Hawk & Shah, 2007, p. 13). However, the ILS has undergone scrutiny based on

numerous utilizations in research of post-secondary students that revealed its usefulness and validity in understanding student learning styles. Felder and Spurlin (2005) explored the applications, reliability and validity of the instrument in which they cited 17 separate studies utilizing the ILS with students in the United States, Great Britain, Canada, Brazil and Puerto Rico (p. 106). Furthermore, there are a number of studies directly showing the validity and reliability of the ILS. Zwyno (2003) conducted a test/retest study with 124 undergraduate students at Ryerson University in Toronto from 2000-2002. The ILS questionnaires were distributed at an eight month interval. The resulting correlations were strong with regards to the Active/Reflective and Sensing/Intuitive scores, .68 and .68 respectively, and moderate with regards to the Visual/Verbal and Sequential/Global scores, .51 for each. Despite the lower levels of the latter, three of the five most stable items were on the Visual scale. Zwyno also noted that Visual scores had a high level of repeatability (p. 6). Livesay, Dee, Nauman and Hites (2002) utilized the ILS to explore learning styles with 245 second year students from Tulane University. In a test/retest format with a seven month interval had correlation coefficients slightly stronger, ranging between .60 to .73 at the .05 alpha level (p. 107). Additionally, Seery, Gaughran and Walderman (2003) used a test/retest format with 167 students from the University of Limerick at only a 4 week interval. Once again, the correlations were strong, between .73 and .87 (p. 107).

Finally, the ILS was created with an eye toward teaching. The combination of this pedagogical approach, the cross theoretical dimensions of the newer version of the instrument, the Felder/Soloman version, and its public availability made the instrument a

comprehensive model of learning style that yields useful information (Hawk & Shah, 2007, p. 13).

Cultural Differentiation. Research on cultural differences in learning styles has been scattered, at best. Banks (2004) suggested that this was a result of the complexity of the issue; class mobility and ethnic culture entwine themselves around the issue of learning characteristics in minority students (p. 20). Studies dealing specifically with learning differences in Hispanic students were even more limited than other minorities and usually narrowly focused, typically on Mexican-Americans and/or elementary students (Griggs & Dunn, 1995, p. 13). Herrnstein and Murray (1994) noted the lack of reliable general studies for this group and postulated it was due to the diverse nature of the population, its “disparate heritage and a wide range of racial stock...that differ markedly in their social and economic profiles” (p. 275).

However, a few studies were conducted in the 70’s that suggested there is a cultural component to learning. For example, Glick (1975) suggested a difference in visual responses to illusions in subjects from industrialized and nonindustrial societies (p. 611). Recently a theoretical look at cultural influences on learning was done by Manikutty et al. (2007). The authors created a framework understanding cultural influences on learning approaches, which despite a reference to “learning styles” in the title, they distinguished from “learning styles” by describing learning approaches as situational rather than a general preference (p. 72). Their framework layered Entwistle’s and Ramsden’s (1983) components of learning approaches, deep/surface and apathetic/strategic (p. 72), with Hofstede’s (1986) dimensions of culture, power distance, individualism/collectivism, uncertainty avoidance time orientation, and

masculinity/femininity (p. 74). Although the framework could be useful in developing theories around cultural differentiation in learning, more research in the area is needed before any practical applications could be developed or utilized.

An earlier study by Lesser et al. (1965), looked at 320 first-grade children across four ethnic groups, Chinese, African-American, Puerto Rican, and Jewish; two socio-economic groups; lower and middle class; and gender. The study explored many variables thoroughly; however, the number of variables studied left inconsistencies in identifying the group status. For instance, the authors admitted that subjects from other non-Puerto Rican Latino cultures would identify as Puerto Rican in the study and the defined Chinese cultural group came from many distinct Chinese ethnicities, and utilized at least four distinct primary languages (p. 21). However, an important finding was the pattern of mental abilities differed by socio-economic class and ethnicity (p. 73).

In 1976 Witkin showed differences in cognitive functioning in different cultures due to differences in socialization and child-rearing practices (p. 45). Witkin utilized research performed by himself, Price-Williams, Bertini, Christiansen, Oltman, Ramirez and Van Meel (1974) and cited two additional studies by Berry (1966) and Dawson (1967a , 1967b, 1969, 1971) to show differences in independent/dependent cognitive functioning in children from culturally and ethnically diverse samples from Italy, Holland, Mexico, Sierra Leone, Inuit tribes, Australia and Hong Kong. He noted that the same socialization principles were seen in studies of western samples as well. Although dated, the accumulation of information from such vast studies, done in a relative synchronous format, added value and legitimacy to his findings and made this a landmark work in the study of cross-cultural cognitive differentiation.

Herrnstein and Murray (1994) published *The Bell Curve*, a comprehensive and controversial overview of intelligence differences across culture and race. The authors suggested that ethnic differences in cognitive ability are similar to cultural and biological differences. To substantiate this they cited studies by Lynn (1991) and Vernon (1982) which highlighted cognitive differences in Asians and Caucasians (p. 273), and numerous studies (Shuey, 1966; Osborne & McGurk, 1982; Sattler, 1988; Vincent, 1991; and Jensen, 1985, 1993), showing differences in African-Americans and Caucasians (p. 277). However, Herrnstein and Murray (1994) noted the wide spectrum of national origins, differences in socio-economic make-up of Latino ethnic heritage and language disparities combined to make conclusions based on cognitive testing for the Hispanic sub-population unconvincing (p. 275).

Furthermore, researchers have questioned the validity of some intelligence measurements based on cultural differences in cognitive styles. For instance, a 1985 study by Gonzales and Roll reviewed intelligence testing in 197 subjects in grades 4, 8, 12 and college freshmen in New Mexico (p. 195). Testing was done using the Group Embedded Figures Test (GEFT), Weschler Adult Intelligence Scale, the Weschler Intelligence Scale for Children, the Culture Fair Intelligence Test, and the Multidimensional Scale of Cultural Differences (MSCD). They divided and compared the results in Anglo-Americans to those of Mexican-Americans. The results suggested no difference in cognitive non-verbal performance between the two groups (p. 201). However, there was a difference shown in verbal ability and vocabulary (p. 201). The authors suggested this was due to language differences and not due to cross-cultural cognitive differentiation (p. 201). Although the dated nature of the study and geographic

limitations of the sample could skew the results, as they relate to today's social, cultural and educational dynamic, the study, nonetheless, presented a notable argument about cross-cultural, or at the very least inter-linguistical, limitations of intelligence testing.

Ramirez and Cateneda (1974) proposed a theory of educational pluralism as a pathway to flexibility in learning. They argued that multi-cultural development was an important aspect of personality development and learning preferences (p. 27). In particular the dual roles a young person of bi-cultural, or multi-cultural, influences produced bi-cognitive functioning, internal and external orientations (p. 67, p. 153). To support their theory the authors looked at children in Cucamonga, California and developed tests for cognitive styles and explored the play between socialization practices and values of Anglo-Americans and Mexican-American practices (p. 88) Like Gonzales and Roll (1985) the dated nature of the study could limit its applicability in today's environment; however, the educational practices suggested by the authors, i.e., encouraging cooperation, acceptance of children's ideas and personalizing (pp. 179-181) have proven to be sound and practical.

Other cross-cultural research has focused on learning differences within second-language classes. Reid (1987) utilized a self-reporting questionnaire modified from existing learning profile instruments to measure learning preferences across six learning styles; visual, auditory, kinesthetic, tactile, group learning, and individual learning of students enrolled in English as a Second Language, ESL, programs from 39 institutions (p. 88). With a sample size of 1,234, analysis of variance was measured across age, language of origin, Test of English as a Foreign Language (TOEFL) score, length of time in the United States, length of time studying English, class and gender (p. 93). The most

significant results came from the language of origins. Korean, Chinese and Arabic students showed divergent learning styles, while Spanish speaking students showed a definitive preference for kinesthetic and tactile learning (p. 96). With the large sample and the multiple variables studied, this research gave a good picture of language learning. From her findings, Reid advocated for the matching of teaching styles or pedagogical strategies with learner profiles based on variables existing in ESL classrooms.

Gradman and Hanania (1991) coded and analyzed 44 variables for 101 foreign language students at the University of Indiana (p. 39). Using multiple-regression techniques they identified 22 factors that had significant impacts on a student's TOEFL scores. Oxford, Ehrman, and Levine (1991) narrowed the list to the "nine most important factors"; namely aptitude, motivation, anxiety, self-esteem, tolerance of ambiguity, risk taking, language learning style age and gender. Their study of students in the United States Foreign Services Institute highlighted the profound impact learning styles could have on foreign language education. Through their studies they also contended that matching pedagogical strategies to student learning styles can enhance achievement, attitudes and behavior in language classes (Oxford & Ehrman, 1993; Oxford, Ehrman, & Levine, 1991).

Felder and Henriques (1995) also suggested a multi-style approach to foreign language education (p. 28). However, they pointed out that an instructor will usually be teaching in a style that is preferred by several types of learners. Balancing this with strategies that employ variations of presentations and use of inductive and deductive techniques in a manner that is comfortable for the instructor and effective for students can greatly enhance the results of a class (p. 29). Some researchers have attempted to justify

one pedagogical method over another based on learning style theories, e.g., Bergsteiner and Avery (2008). However, the majority of the research suggested that understanding the learner's style is the key to pedagogical planning and success in trans-cultural learning environments (Felder & Henriques, 1995; Manikutty et al., 2007; Reid, 1987; Sanchez, 2000).

Conclusion

The literature highlighted that Hispanic culture creates a unique perspective for students who have grown up in it. Those students have a number of social and cultural challenges to face if they want to be successful in an American higher education setting. The literature also made it clear that cultural components can be seen in learning preferences, both cognitively and in personality. Pedagogical planning and student programming that takes these preferences into account will be key to the success of Hispanic population in education.

This study compared the learning styles of Hispanic students and non-Hispanic students, using Felder and Soloman's Index of Learning Styles (1991), an instrument that addresses both cognitive and personality components. This study reviewed the differences in learning styles of Hispanic and non-Hispanic students using quantitative methods. A complete description of the methodology used to quantify the differences as compared to the general population is described in the next chapter.

Chapter 3

Methodology

The purpose of this study was to determine if there are discernable, quantifiable differences of learning styles for undergraduate Hispanic students as compared to non-Hispanic undergraduate students. The study quantifiably categorized learning preferences using Felder and Soloman's (1991) Index of Learning Styles, or ILS. The ILS was designed to assess preferences across four dimensions or domains: active/reflective, sensing/intuitive, visual/verbal, and sequential/global (Felder & Soloman, 2001, pp. 1-4). Analysis on the categorized learning styles was conducted to look for significant relationships between learning style and ethnic identity. Further analysis was done to look for interaction effect in relationships and differences of learning styles based on ethnic identity and gender. This information was utilized to make recommendations on methodological strategies for educational activities, services and environments that address the learning needs of the Hispanic population who attend state-funded, or "public," post-secondary institutions.

Research Questions and Hypotheses

Research Question 1: Is there a correlation in a student's learning style as measured by the Index of Learning Styles (ILS) and a student's ethnic identity as Hispanic or non-Hispanic?

Research Hypothesis 1a: There is a correlation in the Active/Reflective dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 1a: There is no significant correlation in the Active/Reflective dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Research Hypothesis 1b: There is a correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 1b: There is no significant correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Research Hypothesis 1c: There is a correlation in the Visual/Verbal dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 1c: There is no significant correlation in the Visual/Verbal dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Research Hypothesis 1d: There is a correlation in the Sequential/Global dimension of learning as measured by the ILS based and a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 1d: There is no significant correlation in the Sequential/Global dimension of learning as measured by the ILS based and a student's ethnic identity as Hispanic or non-Hispanic.

Research Question 2: Is there a correlation in a student's learning style as measured by the Index of Learning Styles (ILS) and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender?

Research Hypothesis 2a: There is a correlation in the Active/Reflective dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Null-Hypothesis 2a: There is no significant correlation in the Active/Reflective dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Research Hypothesis 2b: There is a correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Null-Hypothesis 2b: There is no significant correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Research Hypothesis 2c: There is a correlation in the Visual/Verbal dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Null-Hypothesis 2c: There is no significant correlation in the Visual/Verbal dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Research Hypothesis 2d: There is a correlation in the Sequential/Global dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Null-Hypothesis 2d: There is no significant correlation in the Sequential/Global dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Research Question 3: Is there a difference in a student's learning style as measured by the Index of Learning Styles, ILS, based on a student's ethnic identity as Hispanic or non-Hispanic?

Research Hypothesis 3a: There are differences in learning styles as measured by the Index of Learning Styles, ILS, based on a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 3a: There are no ILS mean differences based on a student's ethnicity.

Research Hypothesis 3b: There is a difference in the Active/Reflective dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 3b: There is no mean difference in the Active/Reflective dimension of learning as measured by the ILS based on a student's ethnicity.

Research Hypothesis 3c: There is a difference in the Sensing/Intuitive dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 3c: There is no mean difference in the Sensing/Intuitive dimension of learning as measured by the ILS based on a student's ethnicity.

Research Hypothesis 3d: There is a difference in the Visual/Verbal dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 3d: There is no mean difference in the Visual/Verbal dimension of learning as measured by the ILS based on a student's ethnicity.

Research Hypothesis 3e: There is a difference in the Sequential/Global dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 3e: There is no mean difference in the Sequential/Global dimension of learning as measured by the ILS based on a student's ethnicity.

Research Question 4: Are there differences in learning styles as measured by the ILS for college students identifying as Hispanic or non-Hispanic based on gender?

Research Hypothesis 4a: There are differences in learning styles as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Null-Hypothesis 4a: There are no differences in learning styles as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Research Hypothesis 4b: There is a difference between the preferences in the Active/Reflective dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Null-Hypothesis 4b: There are no mean differences between the preferences in the Active/Reflective dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Research Hypothesis 4c: There is a difference between the preferences in the Sensing/Intuitive dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Null-Hypothesis 4c: There are no mean differences between the preferences in the Sensing/Intuitive dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Research Hypothesis 4d: There is a difference between the preferences in the Visual/Verbal dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Null-Hypothesis 4d: There are no mean differences between the preferences in the Visual/Verbal dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Research Hypothesis 4e: There is a difference between the preferences in the Sequential/Global dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Null-Hypothesis 4e: There are no mean differences between the preferences in the Sequential/Global dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Research Design

A non-experimental quantitative research design was chosen to address the research question. Quantitative research emphasizes objectivity through quantification by utilizing numbers, statistics, structure and control (McMillan & Schumacher, 2006, p. 23). The study was comparative in nature using a cross-sectional descriptive approach. A cross-sectional approach studies different groups at the same time (p. 216). In this study a comparison is made between students identifying as “Hispanic” and those identifying as “non-Hispanic” and the possible differences in learning styles based on this identification.

Instrument

The Index of Learning Styles, ILS, is a 44 question instrument designed to assess preferences in eight categories across four dimensions of learning styles: active or reflective, sensing or intuitive, visual or verbal, and sequential or global. These dimensions were highlighted in the Felder-Soloman (1991) learning style model and correspond to a four core questions revolving around learning preferences:

1. What is the preference in information perception?
2. What is the preference in information reception?
3. What is the preference in information processing?
4. How does a person work toward understanding? (Felder & Brent, 2005, p. 60)

The four dimensions align themselves as follows:

Learning Dimension	Preference Defined	Learning Preferences and tendencies	
Active/ Reflective	Information Processing	Active Learner	Reflective Learner
	<i>Information Preferences:</i>	Retain and understand information best by discussing it, applying it or explaining it to others.	Prefer to think about information quietly before doing anything with it.
	<i>Learning Tendencies:</i>	"Let's try it out and see how it works."	"Let's think it through first."
	<i>Learning Activities:</i>	Like group work.	Prefer working alone.
Sensing/ Intuitive	Information Perception	Sensors	Intuitors
	<i>Information Preferences:</i>	Sights, sounds, physical stimuli.	Memories thoughts, insight.
	<i>Learning Tendencies:</i>	Practical and careful.	Work faster and with more innovation.
	<i>Learning Activities:</i>	Like learning facts. Solve problems with established methodologies. Patient with details. Good at memorizing. Dislike complication and surprise.	Like discovering possibilities and relationships. Better at grasping new concepts. Like innovations. More comfortable with abstraction and mathematical formulations. Dislike memorization repetition and routine calculations.

Figure 4 continues

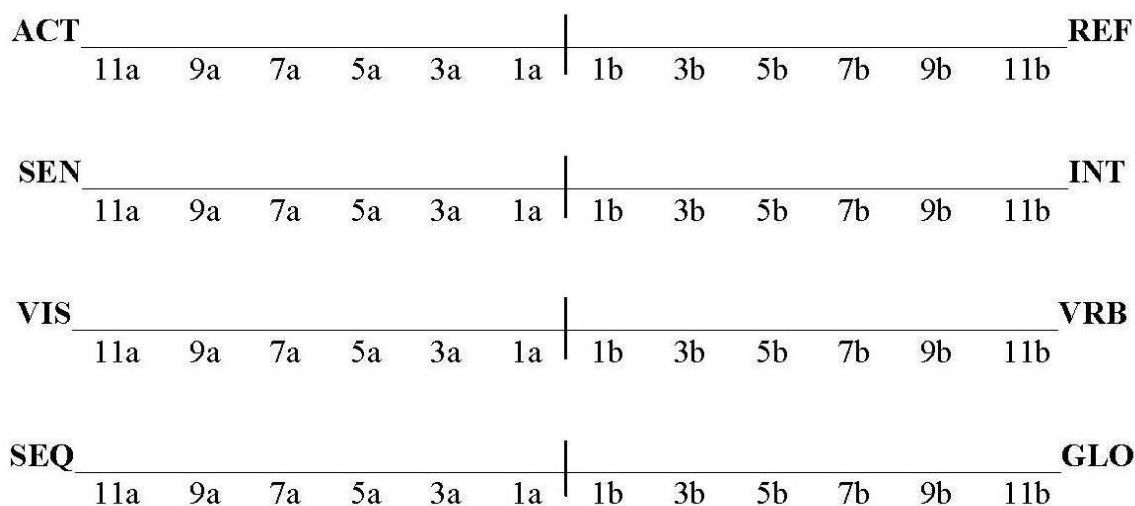
Visual/ Verbal	Information Reception	Visual Learners	Verbal Learners
	<i>Information Preferences:</i>	Pictures Diagrams, flow charts, time lines, films, and demonstrations.	Written and spoken explanations.
	<i>Learning Activities:</i>	Remember best what they see.	Get more out of words.
Sequential/ Global	Method of Understanding	Sequential Learners	Global Learners
	<i>Information Preferences:</i>	Gain understanding in linear steps, with each step following logically from the previous one.	Learn in large jumps, absorbing material without necessarily seeing connections, and then suddenly "getting it."
	<i>Learning Tendencies:</i>	Follow logical steps towards in finding solutions.	Solve complex problems quickly. Put things together in unique ways once they have grasped the big picture. May have difficulty explaining how they arrived at conclusions.

(Adapted from Felder & Soloman, 2001, pp.1-4).

Figure 4. Dimensions of learning in index of learning styles.

Felder and Soloman (1991) noted that in each dimension there are varying degrees of preference (p. 7). The variation is measured through answers to the items in each dimension. In the ILS each learning style dimension is associated with 11 forced choice items with responses corresponding to one or the other category of the dimension (Felder & Spurlin, 2005, p. 104). The difference between the responses for items in each dimension defined both the preference and degree of preference. He continued:

The dichotomous learning style dimensions of this model are continua and not either/or categories. A student's preference on a given scale (e.g. for inductive or deductive presentation) may be strong, moderate, or almost nonexistent, may change with time, and may vary from one subject or learning environment to another. (Felder, 1993, *Dimensional Learning Style*, ¶7)



(Adapted Felder & Soloman, 1991, *Index of Learning Styles*, p. 6)

Figure 5. Index of learning styles dimensional report.

As mentioned in the review of the literature, the Felder and Silverman model (1988) and the subsequent Index of Learning Styles developed by Felder and Soloman (1991) utilized a combination or layered approach to capture the most important learning style differences and it has a strong connection to pedagogical practice. The cross theoretical dimensions of the instrument made it one of the more complete models of learning (Hawk & Shah, 2007, p. 13). Similar to other models, Felder and Silverman utilized four dichotomous dimensions, the sensing/intuitive dimension of the MBTI (1962, 1985), the Active/Reflective dimension utilized in Kolb's theory (1984), Verbal/Visual is similar to Fleming's VARK mannerisms (2001), and the additional

dimension of Sequential/Global that the authors suggested has many analogs in other models including Gregorc (1982). Additionally, the ILS had undergone scrutiny based on numerous utilizations in research of post-secondary students.

Reliability. MacMillan and Schumacher (2006) defined reliability as the consistency between measurements or the variance of error across different forms of the same instrument (p. 183). If a given obtained score can be viewed as having true component and an error, the error being an unavoidable difference in results stemming from a number of different factors, the idea is to measure and minimize this error (p. 183).

Reliability is measured utilizing one of several procedures including Test-retest or stability, equivalence, and internal consistency (p. 184). Each procedure is related to the control of a particular kind of error and is recorded in terms of the error coefficient on a scale from .00 to .99, with a higher coefficient meaning a higher degree of reliability (p. 183). Psychometric measurements for reliability in ILS have been conducted using both measures of stability and internal consistency (Livesay et al., 2002; Seery et al., 2003; Van Zwanenberg, Wilkinson, & Anderson, 2000; Zwyno, 2003). Below is a description of the results of those studies.

Test-retest/Stability. Stability or test-retest reliability is calculated by measuring the same characteristics with the same test subjects over time. Measurements in stability for the ILS were recorded by Livesay et al. (2002), Seery et al. (2003), and Zwyno (2003). For all three of these studies, coefficients varied between .5 and .9 for testing intervals ranging from 4 weeks to 8 months, all significant at the .05 alpha level.

Table 1

Test/Re-Test Reliability Comparisons for ILS

Study	Time	N	Active/ Reflective	Sensing/ Intuitive	Visual/ Verbal	Sequential/ Global
Seery	4 weeks	46	.804	.787	.87	.725
Livesay	7 months	24	.73	.78	.68	.60
Zwyno	8 months	124	.683	.678	.511	.507

(Adapted from Felder & Spurlin., 2005, p. 107)

Zwyno's (2003) test/retest study was conducted with undergraduate students at Ryerson University in Toronto from 2000-2002 (p. 2). The ILS questionnaires were distributed at an eight month interval. The longer interval was due to the practical realities of classroom teaching and an effort to minimize test-fatigue and intrusiveness on students. The resulting correlations were strong with regards to the Active/Reflective, .683, and Sensing/Intuitive, .678, scores and moderate with regards to the Visual/Verbal, .511, and Sequential/Global scores, .507 (p. 5). Despite the lower levels of the latter, three of the five most stable items were on the Visual scale (p. 5). Zwyno also noted that Visual scores had a high level of repeatability (p. 6). Zwyno cited Thompson and Vacha-Hasse's (2000) work on psychometrics and data analysis in educational assessment as he theorized that the homogeneity and heterogeneity of scores affected the reliability as small changes in raw scores could lead to large differences in rankings and lower correlations.

Internal Consistency. Internal Consistency is based on the average correlation between items in an instrument. Unlike test-retest reliability, internal consistency

provides an estimate of reliability with just one administration. The internal consistency reliability is generally referred to as Cronbach's coefficient alpha (Carmines & Zeller, 1979; Litzinger, Lee, Wise, & Felder, 2007).

Internal consistency reliability refers to the internal correlation of responses to the items in the measurement tool. Felder and Spurlin (2005) argued that the ILS is a measurement of preference or attitude and as such have a acceptable alpha of .5 or higher, as suggested in Tuckman (1999). Felder and Spurlin (2005) cited several studies, Livesay et al. (2002), Seery et al. (2003), and Zywno (2003), for which the alpha values exceeded this standard in all dimensions of the ILS. However, one study using the ILS was found where the alpha value in one dimension did not fall into the acceptable range. In the Van Zwanenberg et al. (2000) study the alpha value for the Sequential/Global dimension was .41 (p. 108). Felder and Spurlin (2005) noted that the study was smaller in comparison to a few of the others, $n = 279$, and that alpha values for all dimensions in the Van Zwanenberg study were lower than the other studies (p. 107). Felder pointed out that data from all four studies showed that the active-reflective, sensing-intuition and visual-verbal scales are independent scales (p. 108). He did, however, admit that the sensing-intuitive and sequential-global are correlated (p. 108). However, he noted that the practical implications of this are not disconcerting as "instructional methods needed to address preferences on one scale are not distinct from those needed to address preferences on the other" (p. 108).

The Zywno (2003) Internal Consistency study was performed using 557 ILS questionnaires, consisting of 338 originals and 124 retests from his test/retest study, plus 68 samples collected from engineering faculty from Concordia University in Montreal,

Table 2

Study Comparison of Internal Consistency for ILS

Study	n	Active/ Reflective α	Sensing/ Intuitive α	Visual/ Verbal α	Sequential/ Global α
Van Zwanenberg	279	.51	.65	.56	.41
Livesay	255	.56	.72	.60	.54
Spurlin	584	.70	.76	.69	.55
Zwyno	557	.60	.70	.63	.53

(Adapted from Zwyno, 2003, p. 8)

and 27 student samples taken during a 1999 pilot study (p. 4). The researcher excluded any cases missing items and showed a Cronbach Alpha between .530 and .697, .50 to .69 when excluding retest and pilot study data. All above the .5 standard suggested by Tuckman (1999).

Table 3

Zwyno's Measures of Internal Consistency for ILS

	Cases	Scale Mean	Scale Variance	Scale STD	α
Active/ Reflective	540	5.7889	5.6177	2.3702	.595
Sensing/ Intuitive	539	6.2430	7.0245	2.6504	.697
Visual/ Verbal	544	8.1801	4.4537	2.1104	.633
Sequential/ Global	532	5.7726	4.7900	2.1886	.530

(Adapted from Zwyno, 2003, p. 8)

The 2000 Van Zwanenberg et al. study, mentioned by both Felder and Zwyno, compared the ILS and another learning style predictor, Honey and Mumford's Learning Style Questionnaire (1992), in terms of their ability to predict academic performance (p. 365). Neither instrument was developed as such a predictor nor did they give the researchers evidence to suggest they could or should be used as such (Felder & Spurlin, 2005, p. 105). The sample size for the ILS consisted of 284 undergraduate students from the United Kingdom, of which 279 were used (p. 369). However, in looking at the internal consistency of the ILS they found all scales except sequential/global exceeded Tuckman's standard of .5 for measurements of preference (p. 371). Despite the obvious flaw in the design of the Van Zwanenberg et al. study (Using learning style as a predictor of academic performance brings the legitimacy of the data into question as this is beyond the scope of the design of these instruments) the validity data can be used as a reference point.

Table 4

Van Zwanenberg's Measures of Internal Consistency for ILS

	N	α
Active/ Reflective	279	.595
Sensing/ Intuitive	279	.697
Visual/ Verbal	279	.633
Sequential/ Global	279	.530

(Van Zwanenberg, 2000, p. 371)

Data on the Index of Learning Styles supported the instrument's validity and reliability as a statistically legitimate instrument for measuring learning style in educational settings. Although the instrument has not been utilized as frequently as other instruments like the MBTI, Kolb's LSI or Dunn and Dunn's PEP it does have enough statistical psychometric support to its use in studies such as this one.

Sample

North Carolina has 16 public colleges and universities. The University of North Carolina-Chapel Hill, North Carolina State University, The University of North Carolina-Wilmington and the University of North Carolina-Charlotte were chosen as sample populations for this study based on their Hispanic student populations, regional locale and academic commonality. These campuses are within 200 miles of each other and have four of the higher undergraduate populations in the state.

Gaining access to the total sample proved to be practically impossible given the logistical preferences of the institutions. Due to the nature of these differences in institutional logistics a combination of approaches were utilized for distribution. One institution, the University of North Carolina-Charlotte, was able to utilize direct electronic mailing to lists generated by the registrar, one list of students self-identifying as Hispanic and another list computer randomized of non-Hispanic students. A second institution, the University of North Carolina-Wilmington, utilized direct electronic mailing to a generated list of students self-identifying as Hispanic and then electronic mailings to class participants of general education classes where the faculty agreed to

Table 5

Institutional Characteristics

Inst.	Location	Undergraduate Student Population (2006-07)	2005 Carnegie Classification	2005 Carnegie Undergraduate Program Classification	Special Designation	Hispanic Student Population % (2006-07)
UNC-CH	Chapel Hill, NC	17,124	Doctoral/Research Universities— Extensive	A&S+Prof/HGC: Arts & sciences plus professions, high graduate coexistence	State Flagship	5%
UNCC	Charlotte, NC	17,032	Master's Colleges and Universities I	Bal/HGC: Balanced arts & sciences/professions, high graduate coexistence	Carnegie Designation- Urban	4%
UNCW	Wilmington, NC	10,955	Master's Colleges and Universities I	Bal/SGC: Balanced arts & sciences/professions, some graduate coexistence		3%
NCSU	Raleigh, NC	23,730	Doctoral/Research Universities— Extensive	Bal/HGC: Balanced arts & sciences/professions, high graduate coexistence	Land grant	3%

(Adapted from Institutional Profiles, University of North Carolina 2007-2008 (2007) and Carnegie Foundation for the Advancement of Teaching (2009). United States Department of Education Institute of Education Sciences. National Center for Education Statistics. Integrated Post Secondary Education Data System (IPEDS).)

allow such mailings. The last two institutions, the University of North Carolina-Chapel Hill and North Carolina State University, allowed for postings to general list-serves with undergraduate membership (see Table 6).

Table 6

Population Return Rates

Institution	Distribution Method	Sample Size (N)		Response Rate
		Hispanic	Non-Hispanic	
UNCC	Direct Mailing	532	584	6%
UNC-CH	List-Serve	195	164	3%
	(asblatino, cenalatina, clc, culturalconnection, envrbsph, unc_program_in_latina_o_studies, uncclubsprints, upcsundergrad)			
NCSU	List-Serve	397	835	4%
	(MSA, HSA, cedstudents, collegedemocrats, collegerepublicans, mifamilia)			
UNCW	Direct Mailing	576	146	7%

In an effort to maximize the return rate and sample size a “four contact model” of administration will be followed (Dillman, 2000, p. 177). The model entailed pre-notification, and a follow-up procedure after the initial administration which includes a second contact in the form of a “Thank you” or reminder. Then a third contact which is similar to the first administration. A fourth and final contact emphasizing the importance of the research (p. 178).

Variables

The independent variables in this study were demographic in nature. For the purpose of this study the primary independent variable was ethnic identification as either Hispanic or non-Hispanic. The term Hispanic refers to a person of Hispanic origin, from Spain or any Spanish speaking country from South America or Central America. This definition refers to persons who self-identify their origin as Mexican-American, Chicano, Mexican, Mexicano, Puerto Rican, Cuban, Central or South American, or from other Latino heritage (U.S. Census, n.d.b). The term Hispanic was a term created by the United States government during the civil rights era as a response to lobbying from the Spanish-speaking community. The term has been utilized by governmental agencies for social and demographic tracking purposes (Vazquez, 2004, Origins ¶1).

The other independent variable was gender, male or female.

The dependent variables for this study were the four dimensions of learning preferences as described Felder & Soloman (1991) learning style model, sensing or intuitive, visual or verbal, active or reflective, and sequential or global. These will be measured using the Index of Learning Styles, ILS, developed by Felder and Soloman (1991).

Data Collection

Prior to data-collection a pilot study was be conducted with college students from institutions other than those selected for analysis during the study. The Index of Learning Styles was administered in both hard copy and electronic forms. The results from both sessions were analyzed to insure the use of proper statistical analysis during the actual study and to evaluate the efficiency and effectiveness of data collection methodology.

For further information on the pilot study refer to section labeled “Pilot Study” beginning on page 70 of this paper.

In order to navigate the institutional specific regulations and guidelines for this type of research and in order to gain greater access and acceptability in the sample, representatives from each campus were contacted. The project was explained to them and they agreed in principal to assist in some of the logistical aspects of the project. These representatives became the point person for the institution for this study. The official duties of these representatives varied from campus to campus, but all had connections with the Hispanic student populations and were familiar with educational research regulations on their respective campus. In order to prevent the possibility of coercion a contract containing an outline of specific logistical duties in the administration of the instrument and a statement of non-coercion was administered to each institutional contact, see Appendix D. Representatives from UNC-CH, UNCC, and UNCW signed the contract and statement of non-coercion statement. The representative from North Carolina State University was advised against signing the form by university legal counsel; however this representative had no direct contact with participants and only directed the researcher to list-serves which would be of interest in the study.

The Nebraska Evaluation and Research Center estimated that a respondent sample size of 150 would be sufficient to analyze the data using Correlation, ANOVA and MANOVA testing procedures. Schaefer and Dillman (1998) suggested an average response rate for e-mail surveys at 28.5% (p. 380). Additionally they noted increases in response rates with multiple contacts, showing a 58% response rate using all e-mail pre-

Table 7

Institutional Departments of Contacts for Campuses

Institution	Institutional Department
UNC-CH	Diversity and Multicultural Affairs
UNCC	Multicultural Academic Services
UNCW	Institutional Diversity and Inclusion
NCSU	Provost Office for Student Diversity

notification, survey, reminder, and replacement surveys (p. 386). However, Kaplowitz, Hadlock, and Levine (2004) suggested a return rate of approximately 20% in e-mail and web based surveys with college students (Results, Figure 1).

As noted earlier, due to the nature of the logistical differences in institutional communication and policy a combination of approaches were utilized for distribution; each institution proposed and utilized a unique distribution method. The University of North Carolina Charlotte was able to utilize a direct electronic mailing to two lists generated by the registrar for that institution, one list of students self-identifying as Hispanic and another list computer randomized of non-Hispanic students. The University of North Carolina Wilmington utilized a similar direct electronic mailing to a generated list of students self-identifying as Hispanic and then electronic mailings to class participants of general education classes where the faculty agreed to allow such mailings. The last two institutions, the University of North Carolina Chapel Hill and North Carolina State University allowed for postings to general list-serves with undergraduate membership, the researcher was directed to list-serves with high participation by Hispanic students. As a result of this mixed methodology, the sample size and response

rates varied. However, in an effort to maximize the return rate and sample size a “four contact model” of administration was followed (Dillman, 2000, p. 177). This model entailed pre-notification, administration, and a follow-up procedure after the initial administration which includes a second contact in the form of a “Thank you” or reminder. Then a third contact which is similar to the first administration. A fourth and final contact emphasizing the importance of the research (p. 178).

Pre-notification helped to prevent the perception of “spamming” due to the nature of unsolicited e-mails (Shannon, Johnson, Searcy, & Lott, 2002, Discussion and Recommendations ¶4). Pre-notification was sent to participants in the study through the institutional representative working in coordination with the guidelines specified for their campus or posted on the respective list-serves. This pre-notification was in the form of an e-mail introducing the study to participants and will be sent in collaboration with the participating institutions, see Appendix E.

The instrument itself was distributed via an e-mail, sent in coordination with the campus representatives, the protocol laid out for them by their respective campuses and adhering to the articles of non-coercion sited in the contract, or a list-serve posting adhering to the rules and standards of institutional list-serve policies, see Appendix F. This e-mail or list-serve posting contained a link to a Survey-Monkey™ version of the ILS. The participants filled out the form and submitted it via “Survey Monkey™.” Once submitted, data from each form was collected in an Excel spreadsheet. The import into the spreadsheet isolated responses from identifying information of respondents and no reference to identifying information from the sender was collected.

Follow-up procedures followed a timeline specified by Dillman (2000, p. 178). These procedures included a thank-you/reminder. This was in the form of an e-mail or list-serve posting and was sent two weeks following the distribution of the instrument, see Appendix G. Four weeks after initial distribution, a second follow-up e-mail highlighting the importance of the research and its impact on college students and institutions was sent, see Appendix H. Finally, eight weeks following the initial administration of the instrument a final notification was sent to participants. This e-mail focused on the importance of the survey as it related to both the research and to the completion of the study, see Appendix I.

Pilot Study

In order to understand the data collection methods, the sample reaction to the instrument and unforeseen variables a pilot study was completed with a sample from a fourth campus in the University of North Carolina system, University of North Carolina-Pembroke. The pilot study was conducted in two sessions. The first session consisted of seven students who were administered the ILS in hard copy form. After completion students were interviewed in a group setting. The purpose of this administration was to get subject feedback concerning how the instrument is read and understood. Participants were asked:

- How long did the instrument take to complete?
- Were the items easy to understand?
- Did you, the participant, have any questions/concerns/or misunderstandings about the instrument, or individual items contained in the instrument?
- Additional Comments.

The second session of the Pilot Study was an administration of the ILS using the Google forms methodology similar to the “Survey Monkey™” administration described in the “Data Collection” section of this chapter. In addition to the demographic data, and the ILS items; items related to the reading and understanding of the instrument were included.

The pilot study showed a willingness on the part of participants to participate in the study. All students interviewed said the questions were understandable with a majority of participants rating it in the top two categories of understanding on a five level Likert scale. The majority of participants also reported the time to complete the instrument was 10 minutes or less.

A concern which the Pilot study highlighted revolved around the use of “Google” forms technology which had been the original platform planned for distribution. The “Google” platform proved to be unstable as it would “time out” on participants and according to Google a “known issue” of the system was that not all responses were collected due to incompatibility issues with some browsers. These concerns prompted the researcher to opt for the more stable commercial “Survey Monkey™” platform utilized in the actual data collection.

Analysis

The raw data from Survey-Monkey™ was uploaded to a Microsoft Excel spread sheet where formulas were added to score the items according to specifications from Felder and Soloman (1991). The items were sorted according to each of the four dichotomous dimensions of the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal, Sequential/Global. Each dimension has 11 items in the instrument that relate to that

dimension. A total score for each dimension comes from the difference between answers for each of the dimensional roles (see Figure 6). For example, if a respondent scored 7 in Visual and 4 in Verbal the score for that dimension would be 3 Visual. Each individual instrument was scored on a linear dimensional scale, and a dimensional score for each participant was calculated.

ACT/REF			SNS/INT			VIS/VRB			SEQ/GLO		
Q	a	b	Q	a	b	Q	a	b	Q	a	b
1	_____	_____	2	_____	_____	3	_____	_____	4	_____	_____
5	_____	_____	6	_____	_____	7	_____	_____	8	_____	_____
9	_____	_____	10	_____	_____	11	_____	_____	12	_____	_____
13	_____	_____	14	_____	_____	15	_____	_____	16	_____	_____
17	_____	_____	18	_____	_____	19	_____	_____	20	_____	_____
21	_____	_____	22	_____	_____	23	_____	_____	24	_____	_____
25	_____	_____	26	_____	_____	27	_____	_____	28	_____	_____
29	_____	_____	30	_____	_____	31	_____	_____	32	_____	_____
33	_____	_____	34	_____	_____	35	_____	_____	36	_____	_____
37	_____	_____	38	_____	_____	39	_____	_____	40	_____	_____
41	_____	_____	42	_____	_____	43	_____	_____	44	_____	_____
Total (sum X's in each column)											
ACT/REF			SNS/INT			VIS/VRB			SEQ/GLO		
a		b	a		b	a		b	a		b
_____		_____	_____		_____	_____		_____	_____		_____
(Larger – Smaller) + Letter of Larger (see below[*])											
_____		_____	_____		_____	_____		_____	_____		_____

^{*}Example: If you totaled 3 for a and 8 for b, you would enter 5b in the space below.

(Adapted Felder & Soloman, 1991. *Index of Learning Styles*, p. 6)

Figure 6. Index of learning styles scoring sheet.

Once learning styles had been determined for each participant the results were analyzed with the assistance of the Nebraska Evaluation and Research Center using standard SAS and SPSS statistical software. Analysis for these findings combined the use of correlation, multivariate and univariate testing based on the dimensional scales of

the Index of Learning styles and the differences related to gender and ethnicity to answer four research questions:

- R1: Is there a correlation in a student's learning style as measured by the Index of Learning Styles (ILS) and a student's ethnic identity as Hispanic or non-Hispanic?
- R 2: Is there a correlation in a student's learning style as measured by the Index of Learning Styles (ILS) and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender?
- R3: Is there a difference in a student's learning style as measured by the Index of Learning Styles (ILS) based on a student's ethnic identity as Hispanic or non-Hispanic?
- R4: Are there differences in learning styles as measured by the ILS for college students identifying as Hispanic or non-Hispanic based on gender?

Correlation Testing. Research Questions 1 and 2 revolved around the relationship between the four domains of the ILS and ethnic identity and the interaction of ethnicity and gender. This required a determination of the strength of the relationship between scores on the dimensional scales and the independent variables of ethnicity and gender. To test the strength of these relationships a Pearson product-moment correlation statistical analysis was completed. Correlation is a measure of the strength of a relationship between two variables. Correlation is reported from 0, representing a random relationship to 1 or -1, representative of a perfect relationship, either positive or negative (Garson, 2009a, ¶1). This r , or rho value, is calculated to show a linear

relationship between two variables and interpreted as the percent of variance explained by this relationship (McMillan & Schumacher, 2006, p. 485).

Multivariate Testing. MANOVA, Multivariate Analysis, was used to determine the differences between ethnic identity and ILS domain scores related to Research Questions 3 and 4. MANOVA, Multivariate Analysis of Variance, is a statistic which is used to “see the effects of categorical variables on multiple dependent interval variables” (Garson, 2009b, ¶2). The categorical independent variables for which effects were measured were ethnicity, gender and ethnicity*gender interaction. The multiple dependent variables were the four dimensional scales of the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal and Sequential/Global.

Univariate Testing. As each learning style domain in the ILS represents a core area of learning style theory it was important to evaluate each domain using univariate testing (Felder & Brent, 2005, p. 60). Analysis of variance, or ANOVA, is used to “uncover the main and interaction effects of categorical independent variables on an interval dependent variable” (Garson, 2009c, ¶5). Two-way ANOVA Analysis was done to test for interaction effects of the categorical independent variables, gender, ethnicity and gender * ethnicity interaction on the interval dependent variables as measured by the linear dependent continua for each dimensional scales of the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal and Sequential/Global. Post-Hoc procedures were not required for each domain because there were not more than two independent variables. The ANOVA analysis was done to answer Research Questions 3 and 4.

Research Validity

Threats to the internal validity of research should be an important consideration as they are by definition the degree to which the findings match reality (McMillan & Schumacher, 2006, p. 134). For this study the researcher identified threats relating to internal validity as history and selection, and those relating to external validity as population and ecological concerns. History and selection threats were addressed by administering the same instrument over the course of time at several institutions using a variety of distribution methods. By utilizing the four contact model as described by Dillman (2000), treatments for each institution lasted for approximately eight weeks, and as each institution had their own timelines due to logistical considerations the total administration time lasted for eight months. The time itself could be seen as a threat, however each participant was instructed to complete the instrument only once and by analyzing the data collectively across time allowed for the sample to include participants from all points on the historical timeline. The selection threat is similarly addressed by the diverse methods of administration utilized at the different campuses. Although similar in make-up and geographic location, each campus has very distinct student body characteristics. Even in the cases where the use of list-serves was employed, the variety of list-serves, student organizations, student interests and academic interests, and the differences in campus cultures allows for a diverse sample of participants.

While it is impossible to totally eliminate the external threats related to population and ecological conditions in a volunteer based research, the researcher limits the focus of the study to undergraduate students attending public institutions in North Carolina, see the section labeled “Limitations” section beginning on page 8 of Chapter 1. The use of a

variety of methodologies in administration at the four chosen academic institutions created a sample population that was diverse in age, gender, and class year, see Table 8. Additionally, as already stated, administration spanned a time period of eight months allowing for maximum participation and accounting for ecological anomalies that may be associated with any one moment in time.

Table 8

Diversity of Sample

Demographic	Categorical Measure	% of Sample
Age	Under 19	4%
	19-21	59%
	21-24	18%
	25 and older	20%
Gender	Male	30%
	Female	70%
Class Year	Freshman	5%
	Sophomore	19%
	Junior	35%
	Senior	41%

Ethical Considerations

As this research was not experimental in design and did not contain manipulation of subjects there were few ethical issues. However, the researcher insured all participants were aware of the risks and benefits of the project through a Statement of Informed Consent which was the first page of the “Survey Monkey™” posting, see Appendix J. This statement, all e-mails and list-serve postings contained contact information for

researcher and participants were encouraged to contact researcher with any questions or concerns. The data collection did not include any identifying information and “Survey Monkey™” was set-up not to collect IP addresses, thus allowing for complete confidentiality for all participants.

Summary

This study was conducted to determine if there is a discernable commonality in learning styles among North Carolina college students identifying themselves as ethnically Hispanic. The study was done using quantitative analysis of learning styles as identified by the Index of Learning Styles developed by Felder and Soloman (1991). 3,429 participants from the four institutions in the University of North Carolina system, the University of North Carolina-Chapel Hill, North Carolina State University, the University of North Carolina-Wilmington and the University of North Carolina-Charlotte, were given access to the instrument, which addresses both the cognitive and personality aspects of learning, via electronic mailings or list-serve postings. One hundred eight-two respondents completed the instrument and additional demographic items. The results were analyzed to address the research questions stated for this project and the hypotheses for each question were tested using Correlation, MANOVA and ANOVA testing. The product of this analysis will be described in the following chapter. These findings will add to the knowledge base of learning styles, cultural differentiation, and educational practice. Chapter 5 discusses how these findings provide information for educators and administrators as they develop strategies to address the pedagogical, practical, and educational matters facing a growing population of Hispanic students.

Chapter 4

Findings

The purpose of this study was to determine if there are discernable, quantifiable differences of learning styles for undergraduate Hispanic students as compared to non-Hispanic undergraduate students. The study quantifiably categorized learning preferences using Felder and Soloman's (1991) Index of Learning Styles, or ILS. The ILS was designed to assess preferences across four dimensions or domains: active/reflective, sensing/intuitive, visual/verbal, and sequential/global (Felder & Soloman, 2001, pp. 1-4). Analysis on the categorized learning styles was conducted to look for significant relationships between learning style and ethnic identity. Further analysis was done to look for interaction effect in relationships and differences of learning styles based on ethnic identity and gender. This information was utilized to make recommendations on methodological strategies for educational activities, services and environments that address the learning needs of the Hispanic population who attend state-funded, or "public," post-secondary institutions.

Instrument and General Analysis

The Index of Learning Styles, ILS, is a 44 question instrument designed to assess preferences in eight categories across four dimensions of learning styles: active or reflective, sensing or intuitive, visual or verbal, and sequential or global. Each of the four dimensions of the Index of Learning Styles represents a linear dependent scale 0-11, as one score goes up the other goes down. Therefore, analysis on each domain used the scoring for one categorical scale with the understanding that the opposite category in the scale would be conversely related. In order to present the data in the most clear and

efficient manner the titles for each of the ILS dimensional scales are presented using the abbreviated form, Active (Act) or Reflective (Ref), Sensing (Sns) or Intuitive (Int), Visual (Vis) or Verbal (Ver), and Sequential (Seq) or Global (Gbl).

Four research questions, with research hypotheses and null-hypotheses accordingly assigned, were used to look for differences between learning styles as measured by the Index of Learning styles, ILS, based on ethnic heritage, Hispanic or non-Hispanic, and gender. Undergraduate students from four campuses within the 16 campus system of the University of North Carolina were given the opportunity to participate in the study. Correlation, multivariate and univariate analysis using the Pearson product-moment, MANOVA and ANOVA testing were performed on data to look for significance in correlations and differences based on ethnic identity and gender. The University of Nebraska Lincoln's Nebraska Evaluation and Research (NEAR) Center assisted with the statistical analysis. All data were analyzed using a 95% confidence level.

Data Collection

Data collection resulted in 182 responses from a possible 3,429 students who were sent an invitation to participate, a 5% response rate. One hundred sixty-five responses had complete ILS responses and were used to test the hypotheses in this study. Due to the nature of the logistical and policy differences in institutional communication a combination of approaches were utilized for distribution. These approaches included direct electronic mailing at the University of North Carolina Charlotte and University of North Carolina Wilmington, and mass distribution through list-serves at North Carolina State University and University of North Carolina Chapel Hill. The logistical aspects of

this combination of approaches precluded the ability to document demographics of the total population. Of the population who responded, 67 self-identified as Hispanic, 37%, and 115 as non-Hispanic, 67%, and 55 were males, 30%, and 127 Females, 70%.

Wave Analysis

In an effort to maximize the return rate and sample size a “four contact model” of administration was followed (Dillman, 2000, p. 177). The model entailed four waves of responses. The first wave was comprised of those responses received from an initial administration, 52 responses, 29%. A second wave of responses collected from the point of the first reminder until the third contact, 28 responses, 15%. A third wave gathered from the point of the third contact until the final reminder, 70 responses, 38%. Finally, a fourth wave, of those collected after a fourth and final contact which emphasized the importance of the research, 32 responses, 18%.

A wave analysis was done on all responses to insure there were no incidents of non-response bias. An ANOVA was used to compare the means for the Index of Learning Styles by response wave, Table 9. Through the wave analysis the researcher determined that there was no significant difference between the means of the waves.

Whereas this research was concerned with the differences in the independent variables of ethnicity and gender on the ILS scales an additional wave analysis was done to include response wave, ethnicity, gender and the interaction of gender and ethnicity. A second ANOVA was used to compare the means for the Index of Learning Styles by these variables, Table 10. Through the wave analysis the researcher determined that there was no significant difference between variables, response waves and the total population.

Table 9

ANOVA for ILS Scales by Response Wave

ILS Dimensional Scale		SS	Df	MS	F	Sig.
Act(Ref)	Between groups	28.621	3	9.540	1.282	.282
	Within groups	1324.395	178	7.440		
	Total	1353.016	181			
Sns(Int)	Between groups	37.045	3	12.348	1.183	.318
	Within groups	1858.164	178	10.439		
	Total	1895.209	181			
Vis(Ver)	Between groups	38.732	3	12.911	1.191	.315
	Within groups	1930.218	178	10.844		
	Total	1968.951	181			
Seq(Gbl)	Between groups	10.698	3	3.566	.473	.702
	Within groups	1343.395	178	7.547		
	Total	1354.093	181			

P < .05

Table 10

ANOVA Tests of Between-Subjects Effects with Response Wave

Source	ILS Dimensional Scale	SS	Df	MS	F	Sig.
WAVE	Act(Ref)	13.688	3	4.563	.620	.603
	Sns(Int)	31.011	3	10.337	.980	.404
	Vis(Ver)	11.280	3	3.760	.341	.796
	Seq(Gbl)	2.145	3	.715	.095	.963

Table 10 continues

Source	ILS Dimensional Scale	SS	Df	MS	F	Sig.
Gender	Act(Ref)	.598	1	.598	.081	.776
	Sns(Int)	20.587	1	20.587	1.952	.164
	Vis(Ver)	.743	1	.743	.067	.795
	Seq(Gbl)	23.844	1	23.844	3.175	.077
Ethnicity	Act(Ref)	.039	1	.039	.005	.942
	Sns(Int)	4.460	1	4.460	.423	.516
	Vis(Ver)	8.964	1	8.964	.813	.368
	Seq(Gbl)	1.301	1	1.301	.173	.678
WAVE*Gender	Act(Ref)	31.438	3	10.479	1.423	.238
	Sns(Int)	29.506	3	9.835	.933	.426
	Vis(Ver)	6.584	3	2.195	.199	.897
	Seq(Gbl)	40.728	3	13.576	1.808	.148
WAVE*Ethnicity	Act(Ref)	18.511	3	6.170	.838	.475
	Sns(Int)	39.733	3	13.244	1.256	.291
	Vis(Ver)	35.848	3	11.949	1.084	.357
	Seq(Gbl)	18.988	3	6.329	.843	.472
Gender*Ethnicity	Act(Ref)	26.919	1	26.919	3.656	.058
	Sns(Int)	2.855	1	2.855	.271	.604
	Vis(Ver)	36.860	1	36.860	3.344	.069
	Seq(Gbl)	1.250	1	1.250	.166	.684
Wave*Gender* Ethnicity	Act(Ref)	16.507	3	5.502	.747	.525
	Sns(Int)	3.160	3	1.053	.100	.960
	Vis(Ver)	33.628	3	11.209	1.017	.387
	Seq(Gbl)	10.517	3	3.506	.467	.706
Within Groups	Act(Ref)	1222.165	166	7.362		
	Sns(Int)	1750.650	166	10.546		
	Vis(Ver)	1829.654	166	11.022		
	Seq(Gbl)	1246.498	166	7.509		
Total	Act(Ref)	1353.016	181			
	Sns(Int)	1895.209	181			
	Vis(Ver)	1968.951	181			
	Seq(Gbl)	1354.093	181			

P < .05

Campus Analysis

North Carolina has 16 public colleges and universities. The University of North Carolina-Chapel Hill (UNC-CH), North Carolina State University (NCSU), The University of North Carolina-Wilmington (UNCW) and the University of North Carolina-Charlotte (UNCC) were chosen as sample populations for this study based on their Hispanic student populations, regional locale and academic commonality. These campuses are within 200 miles of each other and have four of the higher undergraduate populations in the state, see Table 5: Institutional Characteristics on page 64. However, the campuses are not without differences. Academic programming, campus culture, admission requirements, student support services and residential housing services vary from campus to campus, see Table 11. These differences along with retention and graduation rates create institutional differences which may lead to biases based on campus.

In order to protect against limitations related to biases associated with the campus a respondent attended MANOVA testing was performed to determine if there were significant differences between responses from the four different campuses and ILS domain scores. The categorical independent variable, campus, UNC-CH, UNCC, UNCW, and NCSU, was measured for effects. The multiple dependent variables were the four dimensional scales of the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal and Sequential/Global. This analysis used 180 responses, and excluded the 2 responses for which the campus identification question was not answered. Table 12 shows there were no ILS mean differences based on a student's campus.

Table 11

Institutional Differences

Campus	Location	2009 Average SAT Scores for First- Time Freshman	2007 Freshman to Sophomore Retention Rates	2004-2008 4 -Year Graduation Rates	2006-07 Average Number of Attempted Credit Hours Single Major	Primarily Residential/ Non- Residential Student Housing
UNC-CH	Chapel Hill, NC	1302	96.2%	86%	143.1	Residential
UNCC	Charlotte, NC	1060	78.1%	51%	136.0	Residential
UNCW	Wilmington, NC	1166	85.4%	70%	138.4	Non- residential
NCSU	Raleigh, NC	1184	89.6%	60%	134.8	Residential

Adapted from University of North Carolina-Academics: Retention, Graduation and Persistence Rates of First-Time Full-Time Freshmen (2009); University of North Carolina-General Administration; Institutional Research and Analysis: Institutional Profiles, University of North Carolina 2007-2008 (2007); and University of North Carolina-About the University: Facts and Figures (2009).

Table 12

MANOVA Tests for Campus

Effect		Value	F	Hypothesis df	Error df	Sig.
Campus	Pillai's Trace	0.99753942	0.11	4	176	0.9794
	Wilks' Lambda	0.00246058	0.11	4	176	0.9794
	Hotelling's Trace	0.00246665	0.11	4	176	0.9794
	Roy's Largest Root	0.00246665	0.11	4	176	0.9794

* $p < .05$

MANOVA test for differences using Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root all showed no significant difference, $P = .9794$; $F(4,176) = .11$, $p > .05$.

Analysis and Results

Data were organized and analyzed using SPSS and SAS software. Analysis for these findings combined the use of correlation, multivariate and univariate testing based on the dimensional scales of the Index of Learning styles and the relationships to gender and ethnicity. The results of this analysis and the testing of the hypotheses are described below.

Descriptive Statistics and Interaction of Estimated Means. Whereas each ILS domain represents a linear dependent scale from 0-11, scores from 0-5.5 represent one categorical preference while 5.5-11 represent the opposing preference. The farther away from the 5.5 mid point represents a greater degree of preferences. The descriptive statistics presented in Table 13 show the differences in means for each cohort. These descriptive statistics were utilized in understanding the results of the analysis for Hypothesis 4b-4e.

Estimated Means were calculated for scores on each of the ILS dimensional scales. Estimated Means assess the levels of a factor and interaction effects adjusting means for effects of covariates in the model, unlike multiple comparisons and post hoc tests (Garson, 2009c, Estimate Marginal Means ¶1). Table 14 shows the differences in estimated marginal means for each cohort.

Table 13

Descriptive Statistics

		Hispanic			Non-Hispanic			Total		
Dimensional Scale		N	M	SD	N	M	SD	N	M	SD
ACT/REF	Males	17	6.06	2.015	30	5.57	2.359	47	5.74	2.231
	Females	45	4.91	1.964	73	6.00	2.449	118	5.58	2.329
	Totals	62	5.23	2.028	103	5.87	2.420	165	5.63	2.296
SNS/INT	Males	17	5.35	3.061	30	7.13	2.776	47	6.49	2.977
	Females	45	6.51	2.608	73	6.60	2.707	118	6.57	2.659
	Totals	62	6.19	2.763	103	6.76	2.724	165	6.55	2.744
VIS/VER	Males	17	7.82	2.555	30	7.23	2.596	47	7.45	2.569
	Females	45	6.60	2.580	73	7.48	2.744	118	7.14	2.706
	Totals	62	6.94	2.611	103	7.41	2.691	165	7.23	2.663
SEQ/GBL	Males	17	5.41	1.622	30	6.30	2.351	47	5.98	2.142
	Females	45	6.56	2.040	73	6.04	2.251	118	6.24	2.179
	Totals	62	6.24	1.989	103	6.12	2.272	165	6.16	2.165

Table 14

Estimate Means

		Hispanic				Non-Hispanic			
Dimensional Scale		M	SD	Lower Bound	Upper Bound	M	SD	Lower Bound	Upper Bound
Active/Reflective	Males	4.91	.34	4.24	5.58	6.00	.27	5.48	6.52
	Females	6.06	.55	4.97	7.14	5.57	.41	4.75	6.38
Sensing/Intuitive	Males	6.51	.41	5.71	7.31	6.60	.32	5.97	7.23
	Females	5.35	.66	4.05	6.66	7.13	.50	6.15	8.12
Visual/Verbal	Males	6.60	.40	5.82	7.38	7.48	.31	6.87	8.09
	Females	7.82	.64	6.55	9.10	7.23	.48	6.28	8.19
Sequential/Global	Males	6.56	.32	5.92	7.19	6.04	.25	5.54	6.54
	Females	5.41	.52	4.38	6.45	6.30	.39	5.52	7.08

Lower Bound and Upper Bound are at 95% Confidence Interval

These mean differences were utilized in creating profile plots of the Estimated Mean to interpret the interaction of ethnicity and gender on ILS dimensional scale scores. The researcher chose to use Profile Plots of the Estimated Means for each of the ILS scales because such a plot allowed for a picture of the effect without the error, as opposed to plotting observed means which show both the effect and the error (SPSS Library, n.d., Profile Plots, ¶2). In such plots interaction is denoted by a crossing of the plot lines, the more parallel the lines the less significant the interaction (Seltman, 2010, p. 271). These profile or interaction plots were utilized in the understanding of tests for Null-Hypothesis 4b-4e. Although, originally done to add understanding to the findings the plots sometimes conflicted with the findings of the ANOVA, in such cases the researcher utilized the ANOVA as the test of the hypotheses. However, the researcher chose to present the profile plots because information presented in them were relevant to the findings of this research and add to the knowledge and understanding of the subject of learning style differentiation.

Research Question 1: Is there a correlation in a student's learning style as measured by the Index of Learning Styles (ILS) and a student's ethnic identity as Hispanic or non-Hispanic? Pearson product-moment tests were conducted to look for relationships between Ethnicity, Gender, Ethnicity*Gender Interaction and the four ILS domain scales. Table 15 isolates the correlations with Ethnicity; these data were used to test Null-Hypotheses 1a-1d. Ethnicity was abbreviated as Eth, Gender as Gen and the interaction is denoted with E*G.

Null-Hypothesis 1a. There is no significant correlation in the Active/Reflective dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic

or non-Hispanic. There was no significant relationship between the Active/Reflective dimensional scale of the ILS and a student's ethnic identity. This null-hypothesis was retained, $P = .079$, Pearson product-moment correlation between Active/Reflective scores on the ILS dimensional scale and a student's ethnic identity as Hispanic or Non-Hispanic was $r(165) = -.137$, $p > .05$.

Table 15

Correlations between Ethnicity and ILS Scales

		Eth	Gen	E*G	ACT/ REF	SNS/ INT	VIS/ VER	SEQ/ GBL
Ethnicity	Pearson Correlation	1	.018	.789**	-.137	-.100	-.086	.028
	Sig. (2-tailed)		.815	.000	.079	.202	.271	.720
	N		165	165	165	165	165	165

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Research Hypothesis 1a. There is a correlation in the Active/Reflective dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic. Based on the results of testing on Null-Hypothesis 1a, this research hypothesis was rejected.

Null-Hypothesis 1b. There is no significant correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic. There was no significant relationship between the Sensing/Intuitive dimensional scale of the ILS and a student's ethnic identity. This null-hypothesis was retained, $P = .202$, Pearson product-moment correlation between Sensing/Intuitive scores

on the ILS dimensional scale and a student's ethnic identity as Hispanic or Non-Hispanic was $r(165) = -.100, p > .05$.

Research Hypothesis 1b. There is a correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic. Based on the results of testing on Null-Hypothesis 1b, this research hypothesis was rejected.

Null-Hypothesis 1c. There is no significant correlation in the Visual/Verbal dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic. There was no significant relationship between the Visual/Verbal dimensional scale of the ILS and a student's ethnic identity. This null-hypothesis was retained, $P = .271$, Pearson product-moment correlation between Visual/Verbal scores on the ILS dimensional scale and a student's ethnic identity as Hispanic or Non-Hispanic was $r(165) = -.086, p > .05$.

Research Hypothesis 1c. There is a correlation in the Visual/Verbal dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic. Based on the results of testing on Null-Hypothesis 1c, this research hypothesis was rejected.

Null-Hypothesis 1d. There is no significant correlation in the Sequential/Global dimension of learning as measured by the ILS based and a student's ethnic identity as Hispanic or non-Hispanic. There was no significant relationship between the Sequential/Global dimensional scale of the ILS and a student's ethnic identity. This null-hypothesis was retained, $P = .720$, Pearson product-moment correlation between

Sequential/Global scores on the ILS dimensional scale and a student's ethnic identity as Hispanic or Non-Hispanic was $r(165) = .028, p > .05$.

Research Hypothesis 1d. There is a correlation in the Sequential/Global dimension of learning as measured by the ILS based and a student's ethnic identity as Hispanic or non-Hispanic. Based on the results of testing on Null-Hypothesis 1d, this research hypothesis was rejected.

This study failed to identify a relationship between learning style and a student's ethnic identity. No significant correlation was found between any of the four dimensions of the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Research Question 2: Is there a correlation in a student's learning style as measured by the Index of Learning Styles (ILS) and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender? The Pearson product-moment tests were conducted to look for relationships between Ethnicity, Gender, Ethnicity*Gender Interaction and the four ILS domain scales. Table 16 shows the correlations between independent variables and the four ILS scales, these data were used to test Null-Hypotheses 2a-2d. Ethnicity was abbreviated as Eth, Gender as Gen and the interaction is denoted with E*G.

Null-Hypothesis 2a. There is no significant correlation in the Active/Reflective dimension of learning as measured by the ILS and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender. This null-hypothesis was rejected; there was a negative correlation between the Active/Reflective dimension of the ILS and the interaction of a student's ethnicity and gender $r(165) = -.192, p = .013$.

Research Hypothesis 2a. There is a correlation in the Active/Reflective dimension of learning as measured by the ILS and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender. Based on the results of testing on Null-Hypothesis 2a, this research hypothesis was retained.

Table 16

Pearson Correlations

		Eth	Gen	E*G	ACT/ REF	SNS/ INT	VIS/ VER	SEQ/ GBL
Ethnicity	Pearson Correlation	1	.018	.789**	-.137	-.100	-.086	.028
	Sig. (2-tailed)		.815	.000	.079	.202	.271	.720
	N		165	165	165	165	165	165
Gender	Pearson Correlation		1	.386**	-.032	.013	-.051	.054
	Sig. (2-tailed)			.000	.688	.869	.512	.490
	N			165	165	165	165	165
Interaction (Ethnicity* Gender)	Pearson Correlation			1	-.192*	-.008	-.145	.111
	Sig. (2-tailed)				.013*	.922	.062	.155
	N				165	165	165	165

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Null-Hypothesis 2b. There is no significant correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender. There was no significant

relationship between the Sensing/Intuitive dimensional scale of the ILS, a student's ethnic identity, and gender. This null-hypothesis was retained, $P = .922$, based on Pearson product-moment correlation between Sensing/Intuitive scores on the ILS dimensional scale and a student's ethnic identity as Hispanic or Non-Hispanic and gender was $r(165) = -.008$, $p > .05$.

Research Hypothesis 2b. There is a correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender. Based on the results of testing on Null-Hypothesis 2b, this research hypothesis was rejected.

Null-Hypothesis 2c. There is no significant correlation in the Visual/Verbal dimension of learning as measured by the ILS and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender. This null-hypothesis was retained, $P = .145$, based on Pearson product-moment correlation between Visual/Verbal scores on the ILS dimensional scale and a student's ethnic identity as Hispanic or Non-Hispanic and gender was $r(165) = -.062$, $p > .05$.

Research Hypothesis 2c. There is a correlation in the Visual/Verbal dimension of learning as measured by the ILS and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender. Based on the results of testing on Null-Hypothesis 2c, this research hypothesis was rejected.

Null-Hypothesis 2d. There is no significant correlation in the Sequential/Global dimension of learning as measured by the ILS and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender. This null-hypothesis was retained, $P = .155$, based on Pearson product-moment correlation between

Sequential/Global scores on the ILS dimensional scale, a student's ethnic identity as Hispanic or Non-Hispanic and gender was $r(165) = .111, p > .05$.

Research Hypothesis 2d. There is a correlation in the Sequential/Global dimension of learning as measured by the ILS and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender. Based on the results of testing on Null-Hypothesis 2d, this research hypothesis was rejected.

There was a relationship found between a student's learning style and the interaction of a college student's ethnicity and gender. Specifically a significant correlation was found between the Active/Reflective dimension of learning and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic based and gender. However, the study failed to show a significant correlation between the other three dimensions of learning measured by the ILS, Sensing/Intuitive, Visual/Verbal, and Sequential/Global, and the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender.

Research Question 3: Is there a difference in a student's learning style as measured by the Index of Learning Styles (ILS) based on a student's ethnic identity as Hispanic or non-Hispanic? MANOVA, Multivariate Analysis, was used to determine the differences between ethnic identity and ILS domain scores. MANOVA, Multivariate Analysis of Variance, is a statistic which is used to "see the . . . effects of categorical variables on multiple dependent interval variables" (Garson, 2009b, ¶2). The categorical independent variables for which effects were measured were ethnicity, gender and ethnicity*gender interaction. The multiple dependent variables were the four dimensional scales of the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal and

Sequential/Global. The MANOVA analysis using ethnicity as the independent variable is presented in Table 17. These data were used to test Null-Hypothesis 3a.

Table 17

MANOVA Tests for Ethnicity

Effect		Value	F	Hypothesis df	Error df	Sig.
Ethnicity	Pillai's Trace	.034	1.388 ^a	4	160	.240
	Wilks' Lambda	.966	1.388 ^a	4	160	.240
	Hotelling's Trace	.035	1.388 ^a	4	160	.240
	Roy's Largest Root	.035	1.388 ^a	4	160	.240

* $p < .05$

a: exact statistic

Null-Hypothesis 3a. There are no ILS mean differences based on a student's ethnicity. MANOVA test for differences using Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root all showed no significant difference, $P = .240$; $F(4,160) = 1.388$, $p > .05$. This null-hypothesis was retained.

Research Hypothesis 3a. There are differences in learning styles as measured by the Index of Learning Styles, ILS, based on a student's ethnic identity as Hispanic or non-Hispanic. Based on the results of testing on Null-Hypothesis 3a, this research hypothesis was rejected.

ANOVA Analysis was done to test for interaction effects of the categorical independent variables, gender, ethnicity and gender * ethnicity interaction on the interval dependent variables as measured by the linear dependent continua for each dimensional

scales of the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal and Sequential/Global. The ANOVA analysis isolating ethnicity as the categorical independent variable is presented in Table 18. These data were used to test Null-Hypothesis 3b-3e.

Table 18

ANOVA between Groups Ethnicity

Source	ILS Scale	SS	Df	MS	F	Sig.
Ethnicity	Active	16.251	1	16.251	3.123	.08
	SNS	12.300	1	12.300	1.640	.20
	VIS	8.633	1	8.633	1.219	.27
	SEQ	.609	1	.609	.129	.72
With-in Groups	Active	848.198	163	5.204		
	SNS	1222.609	163	7.501		
	VIS	1154.616	163	7.084		
	SEQ	767.973	163	4.711		
Total	Active	6095.000	165			
	SNS	8304.000	165			
	VIS	9789.000	165			
	SEQ	7037.000	165			

*p < .05

Null-Hypothesis 3b. There is no mean difference in the Active/Reflective dimension of learning as measured by the ILS based on a student's ethnicity. This null-hypotheses was retained, $P = .08$, between the mean scores on the Active/Reflective

dimensional scale of the ILS for Hispanic and Non-Hispanic students, $F(1, 163) = 3.123$, $p > .05$.

Research Hypothesis 3b. There is a difference in the Active/Reflective dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic. Based on the results of testing on Null-Hypothesis 3b, this research hypothesis was rejected.

Null-Hypothesis 3c. There is no mean difference in the Sensing/Intuitive dimension of learning as measured by the ILS based on a student's ethnicity. This null-hypothesis was retained, $P = .20$, between the mean scores on the Sensing/Intuitive dimensional scale of the ILS for Hispanic and Non-Hispanic students, $F(1, 163) = 1.640$, $p > .05$.

Research Hypothesis 3c. There is a difference in the Sensing/Intuitive dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic. Based on the results of testing on Null-Hypothesis 3c, this research hypothesis was rejected.

Null-Hypothesis 3d. There is no mean difference in the Visual/Verbal dimension of learning as measured by the ILS based on a student's ethnicity. This null-hypothesis was retained, $P = .27$, between the mean scores on the Visual/Verbal dimensional scale of the ILS for Hispanic and Non-Hispanic students, $F(1, 163) = 1.219$, $p > .05$.

Research Hypothesis 3d. There is a difference in the Visual/Verbal dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic. Based on the results of testing on Null-Hypothesis 3d, this research hypothesis was rejected.

Null-Hypothesis 3e. There is no mean difference in the Sequential/Global dimension of learning as measured by the ILS based on a student's ethnicity. This null-hypothesis was retained, $P = .72$, between the mean scores on the Sequential/Global dimensional scale of the ILS for Hispanic and Non-Hispanic students, $F(1, 163) = .129$, $p > .05$.

Research Hypothesis 3e. There is a difference in the Sequential/Global dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic. Based on the results of testing on Null-Hypothesis 3e, this research hypothesis was rejected.

This study failed to identify a significant difference in learning styles as measured by the Index of Learning Styles, ILS, based on a student's ethnic identity as Hispanic or non-Hispanic. No significant difference of means between students identifying themselves as Hispanic and those identifying as non-Hispanic was found on the four dimensional scales of learning as measured by the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal, and Sequential/Global.

Research Question 4: Are there differences in learning styles as measured by the ILS for college students identifying as Hispanic or non-Hispanic based on gender? MANOVA, Multivariate Analysis, was used to determine the differences in ILS domain scores based on ethnicity, gender and the interaction of gender and ethnicity. Table 19 presents data from the MANOVA tests using the categorical independent variables of ethnicity, gender and ethnicity*gender interaction and the four dimensional scales of the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal and

Table 19

*MANOVA Tests for Gender*Ethnicity Interaction*

Effect		Value	F	Hypothesis df	Error df	Sig.
Gender	Pillai's Trace	.017	.665 ^a	4	158	.62
	Wilks' Lambda	.983	.665 ^a	4	158	.62
	Hotelling's Trace	.017	.665 ^a	4	158	.62
	Roy's Largest Root	.017	.665 ^a	4	158	.62
Ethnicity	Pillai's Trace	.025	1.027 ^a	4	158	.39
	Wilks' Lambda	.975	1.027 ^a	4	158	.39
	Hotelling's Trace	.026	1.027 ^a	4	158	.39
	Roy's Largest Root	.026	1.027 ^a	4	158	.39
Gender and Ethnicity	Pillai's Trace	.055	2.304 ^a	4	158	.06
	Wilks' Lambda	.945	2.304 ^a	4	158	.06
	Hotelling's Trace	.058	2.304 ^a	4	158	.06
	Roy's Largest Root	.058	2.304 ^a	4	158	.06

* p < .05

Sequential/Global as multiple dependent variables. These data were used to test Null-Hypothesis 4a.

Null-Hypothesis 4a. There are no ILS mean differences in learning styles as measured by the ILS for student's identifying as Hispanic or non-Hispanic based on gender. MANOVA test for differences using Pillai's Trace, Wilks' Lambda, Hotelling's Trace, Roy's Largest Root all showed no significant difference, $P = .06$, $F(4,158) = 2.304$, $p > .05$. This null-hypothesis was retained.

Research Hypothesis 4a. The differences in learning styles as measured by the ILS for student's identifying as Hispanic or non-Hispanic based on gender was marginally significant, marginally above the .05 significance level. Based on the results of testing on Null-Hypothesis 4a, this research hypothesis was rejected.

ANOVA analysis was done to test for interaction effects of the categorical independent variables, gender, ethnicity and gender * ethnicity interaction on the interval dependent variables as measured by the linear dependent continua for each dimensional scales of the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal and Sequential/Global. The ANOVA analysis using ethnicity, gender and gender*ethnicity interaction as categorical independent variables is presented in Table 20. These data were used to test Null-Hypothesis 4b-4e.

Null-Hypothesis 4b. There are no mean differences between the preferences in the Active/Reflective dimensional scale of the ILS for Hispanic and Non-Hispanic students based on gender. There was a significant difference in mean scores on the Active/Reflective dimensional scale of the ILS for Hispanic and Non-Hispanic students based on gender, $F(1,161) = 3.795$, $p = .05$. Although the significance was marginal, this null-hypothesis is rejected.

In support of rejecting Null-Hypothesis 4b the researcher performed a profile plot on the estimate of marginal means. The researcher chose to use a Profile Plot of the Estimated Marginal Means for the ILS Active/Reflective scale because such a plot allowed for a picture of the effect without the error, as opposed to plotting observed means which show both the effect and the error (SPSS Library, n.d., Profile Plots, ¶2). In

Table 20

ANOVA Test of Between-Subjects Effects

Source	ILS Scale	SS	Df	MS	F	Sig.
Gender	Act/Ref	3.985	1	3.985	.775	.38
	Sns/Int	3.075	1	3.075	.413	.52
	Vis/Ver	7.459	1	7.459	1.058	.31
	Seq/Gbl	6.114	1	6.114	1.312	.25
Ethnicity	Act/Ref	2.780	1	2.780	.541	.46
	Sns/Int	27.362	1	27.362	3.671	.06
	Vis/Ver	.653	1	.653	.093	.76
	Seq/Gbl	1.091	1	1.091	.234	.63
Gender and Ethnicity	Act/Ref	19.517	1	19.517	3.795	.05*
	Sns/Int	22.267	1	22.267	2.987	.09
	Vis/Ver	16.864	1	16.864	2.392	.12
	Seq/Gbl	15.362	1	15.362	3.296	.07
Within Groups	Act/Ref	827.952	161	5.143		
	Sns/Int	1200.073	161	7.454		
	Vis/Ver	1134.856	161	7.049		
	Seq/Gbl	750.405	161	4.661		
Total	Act/Ref	6095.000	165			
	Sns/Int	8304.000	165			
	Vis/Ver	9789.000	165			
	Seq/Gbl	7037.000	165			

*p < .05

such plots interaction is denoted by a crossing of the plot lines, the more parallel the lines the less significant the interaction (Seltman, 2010, p. 271). Figure 7 shows how the effect of gender is different for Hispanic and non-Hispanic students on the Active/Reflective dimensional scale. The intersection indicates some interaction effect in the differences of means for the Active/Reflective scale. Whereas, the ILS scales run from 0-11 on a linearly dependent scale, a score of 5.5 and above indicate a learning style which was more active; the higher the score more distinct the degree of preference. The profile plot showed that scores for male Hispanic students were higher than female Hispanic students and female non-Hispanic students were higher than male non-Hispanic students. This can be interpreted as male Hispanic and female non-Hispanic students were more likely to have a greater Active preference than either female Hispanic or male non-Hispanic students.

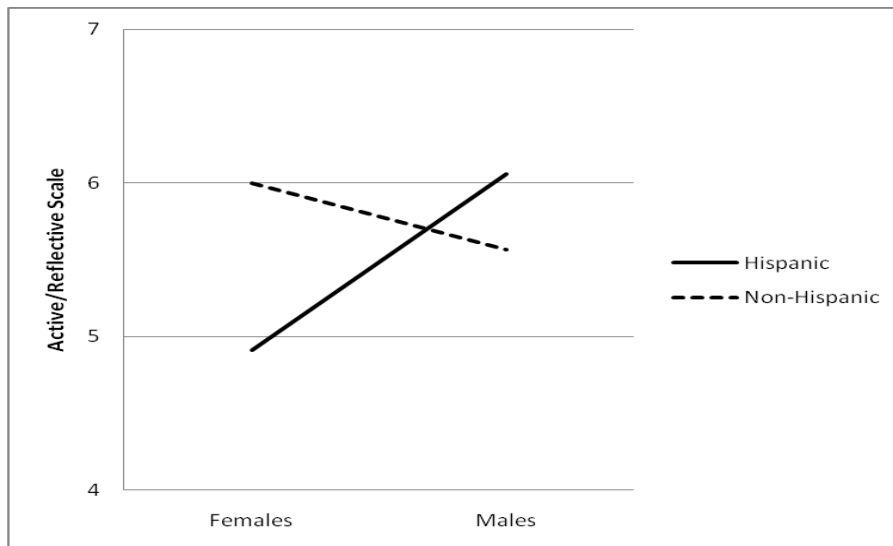


Figure 7. Active/reflective estimated means.

Research Hypothesis 4b. There is a difference between the preferences in the Active/Reflective dimension of learning as measured by the ILS for student's identifying as Hispanic or non-Hispanic based on gender. Based on the results of testing on Null-Hypothesis 4b, this research hypothesis was retained.

Null-Hypothesis 4c. There are no mean differences between the preferences in the Sensing/Intuitive dimension of learning as measured by the ILS for student's identifying as Hispanic or non-Hispanic based on gender. This null-hypothesis was retained, $P = .09$, between the mean scores on the Sensing/Intuitive dimensional scale of the ILS for Hispanic and Non-Hispanic students, $F(1,161) = 2.987$, $p > .05$. A profile plot of the estimated marginal means confirmed this result. Figure 8 showed no cross-over of estimate means thus implying no interaction effect.

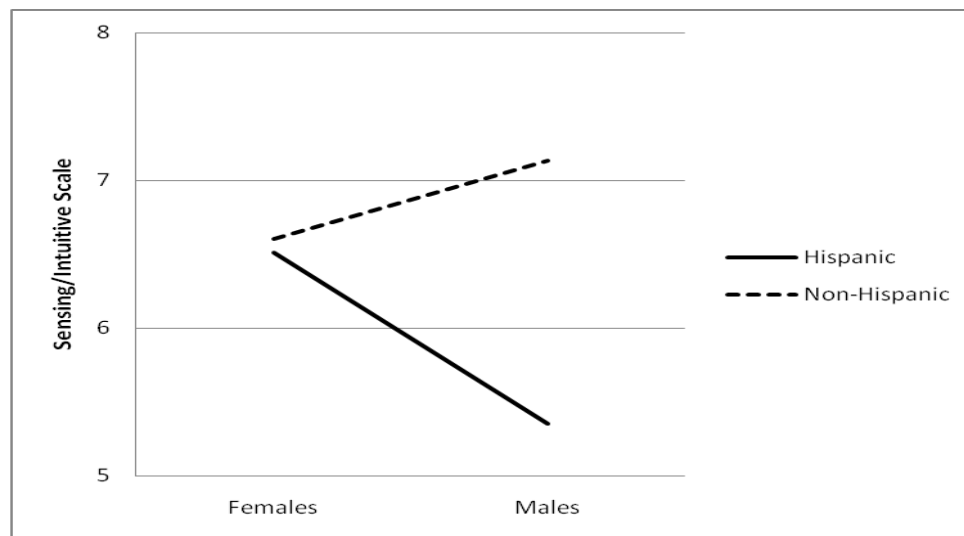


Figure 8. Sensing/intuitive estimated means.

Research Hypothesis 4c. There is a difference between the preferences in the Sensing/Intuitive dimension of learning as measured by the ILS for student's identifying

as Hispanic or non-Hispanic based on gender. Based on the results of testing on Null-Hypothesis 4c, this research hypothesis was rejected.

Null-Hypothesis 4d. There are no mean differences between the preferences in the Visual/Verbal dimension of learning as measured by the ILS for student's identifying as Hispanic or non-Hispanic based on gender. This null-hypothesis was retained, $P = .12$, between the mean scores on the Sequential/Global dimensional scale of the ILS for Hispanic and Non-Hispanic students, $F(1,161) = 2.392$, $p > .05$.

Figure 9 shows how the effect of gender is different for Hispanic and non-Hispanic students on the Visual/Verbal dimensional scale. The intersection indicates some interaction effect in the differences of means for the Visual/Verbal scale. Whereas, the ILS scales run from 0-11 on a linearly dependent scale, a score of 5.5 and above indicate a learning style which was more visual; the higher the score the more distinct the degree of preference. The profile plot showed that scores for male Hispanic students were higher than female Hispanic students and female non-Hispanic students were higher than male non-Hispanic students. This can be interpreted as male Hispanic and female non-Hispanic students were more likely to have a greater Visual preference than either female Hispanic or male non-Hispanic students. Although the interaction effect was not statistically significant when tested with an ANOVA test, the pattern suggests that with a larger sample could produce significant results.

Research Hypothesis 4d. There is a difference between the preferences in the Visual/Verbal dimension of learning as measured by the ILS for student's identifying as Hispanic or non-Hispanic based on gender. Based on the results of testing on Null-

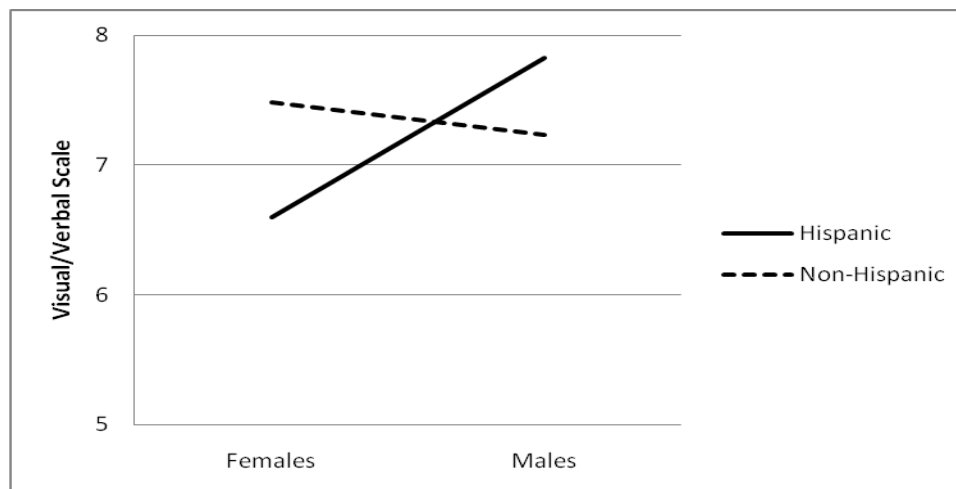


Figure 9. Visual/verbal estimated means.

Hypothesis 4d, this research hypothesis was rejected. However, the profile plot of estimated marginal means suggested the presence of some interaction effect.

Null-Hypothesis 4e. There are no mean differences between the preferences in the Sequential/Global dimension of learning as measured by the ILS for student's identifying as Hispanic or non-Hispanic based on gender. This null-hypothesis was retained, $P = .07$, between the mean scores on the Sequential/Global dimensional scale of the ILS for Hispanic and Non-Hispanic students, $F(1,161) = 3.296$, $p > .05$.

Figure 10 shows how the effect of gender is different for Hispanic and non-Hispanic students on the Sequential/Global dimensional scale. The intersection indicates some interaction effect in the differences of means for the Sequential/Global scale. Whereas, the ILS scales run from 0-11 on a linearly dependent scale, a score of 5.5 and above indicate a learning style which is more sequential; the higher the score the more distinct the degree of preference. The profile plot showed that scores for male Hispanic students were higher than female Hispanic students and female non-Hispanic students

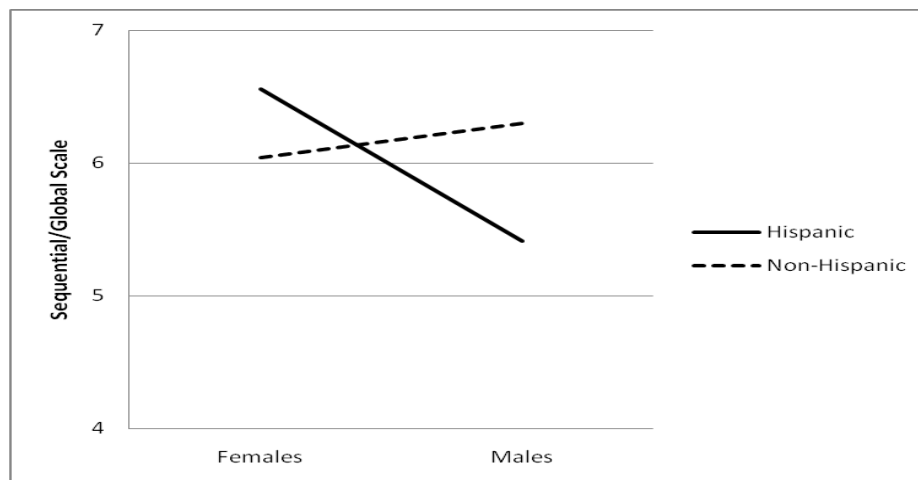


Figure 10. Sequential/global estimated means.

were higher than male non-Hispanic students. This can be interpreted as male Hispanic and female non-Hispanic students were more likely to have a greater Sequential preference than either female Hispanic or male non-Hispanic students. Although the interaction effect was not statistically significant when tested with an ANOVA test, the pattern suggests that with a larger sample could produce significant results.

Research Hypothesis 4e. There is a difference between the preferences in the Sequential/Global dimension of learning as measured by the ILS for student's identifying as Hispanic or non-Hispanic based on gender. Based on the results of testing on Null-Hypothesis 4e, this research hypothesis was rejected. However, the profile plot of estimated marginal means suggested the presence of some effect of the interaction.

There was a difference in a student's learning style based on the interaction of a college student's ethnicity and gender. Specifically a significant difference was found on the Active/Reflective scale based on the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender. Additionally, profile plots on

estimated means showed interaction effects on the Visual/Verbal and Sequential/Global scales, although these were not shown to be significant. The study failed to show differences or interaction effects on the Sensing/Intuitive dimensional scale based on the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender.

Summary

Ethnic identification as Hispanic or Non-Hispanic by itself showed no significant relationship between a students' learning style as measured by the four dimensions of the Index of Learning Styles. There were no significant correlations found between the learning styles of Hispanic students and non-Hispanic students in the Active/Reflective, Sensing/Intuitive, Visual/Verbal or Sequential/Global dimensional scales.

Likewise, gender showed no correlation in student learning style. Although the gender and ethnicity main effects did show a significant relationship, the interaction of the two was significant. The Active/Reflective scale of the Index of Learning Style showed a relationship that was correlated to the interaction of ethnicity and gender. This relationship was dependent on the interaction effect of ethnicity and gender. No other ILS dimensional scales showed a relationship to the interaction of ethnicity and gender.

Furthermore, Ethnic identification as Hispanic or Non-Hispanic by itself shows no significant difference in a students' learning style as measured by the four dimensions of the Index of Learning Styles. There were no significant differences found between the learning styles of Hispanic students and non-Hispanic students in the Active/Reflective, Sensing/Intuitive, Visual/Verbal or Sequential/Global dimensional scales. Additionally,

there were no significant differences found between Hispanic and Non-Hispanic students when all scales were combined in multivariate analysis.

Similarly, gender showed no differences in student learning style. Although the gender and ethnicity main effects were not significant, the interaction of the two showed some significant differences in the means on the Active/Reflective scale. This effect depended on the interaction of ethnicity and gender. No other ILS dimensional scales showed significant differences in mean scores based on the interaction of ethnicity and gender. However profile plots of estimated marginal means showed that both the Visual/Verbal and the Sequential/Global scales have a possibility of significant effect with the interaction of ethnicity and gender.

A discussion of these findings will be advanced in Chapter 5. In addition, the significance of these findings and recommendations for practice and future research will be offered.

Chapter 5

Discussion and Recommendations

Purpose

The purpose of this study was to determine if there are discernable, quantifiable differences of learning styles for undergraduate Hispanic students as compared to non-Hispanic undergraduate students. The study quantifiably categorized learning preferences using Felder and Soloman's (1991) Index of Learning Styles, or ILS. The ILS was designed to assess preferences across four dimensions or domains: active/reflective, sensing/intuitive, visual/verbal, and sequential/global (Felder & Soloman, 2001, pp. 1-4). Analysis on the categorized learning styles was conducted to look for significant relationships between learning style and ethnic identity. Further analysis was done to look for interaction effect in relationships and differences of learning styles based on ethnic identity and gender. This information was utilized to make recommendations on methodological strategies for educational activities, services and environments that address the learning needs of the Hispanic population who attend state-funded, or "public," post-secondary institutions.

Background

The population of persons who ethnically identify themselves as Hispanic is growing in the United States. Research published in the literature has shown that qualitative influences related to ethnic identity can have a profound impact on student development and success. Differences in the perception of higher education and higher educational environments based on cultural and ethnic differences; and how these perceptions and perspectives impact a students' experience; family commitments,

economic considerations, a lack of understanding of the educational system, lack of access to schools and people with higher educational backgrounds all seem to be common challenges for the Hispanic students (Bohon et al., 2005; Gonzalez et al., 2004; Hernandez, 2000; Pidcock et al., 2001; Rendon & Valadez, 1993; Sanchez, 2000; Vasquez, 1998). To date a quantitative analysis on learning preferences has not been thoroughly explored.

This research was conducted to determine if there is a relationship between and/or differences among learning style preferences for undergraduate college students who identify themselves as Hispanic and those who identify themselves as non-Hispanic. The researcher used quantitative methods to study learning styles of undergraduate students from four state universities in North Carolina. Additionally, the interaction of gender differences with ethnic identity was also studied.

Sample and Procedures

North Carolina has 16 public colleges and universities. The University of North Carolina-Chapel Hill, North Carolina State University, The University of North Carolina-Wilmington and the University of North Carolina-Charlotte were chosen as sample populations for this study based on their Hispanic student populations, regional locale and academic commonality. These campuses are within 200 miles of each other and have four of the highest Hispanic undergraduate populations in the state.

Gaining access to the total sample was not possible given the logistical preferences of the institutions. Due to the nature of the logistical and policy differences in institutional communication a combination of approaches were utilized for distribution of the ILS. These approaches included direct electronic mailing at the University of

North Carolina-Charlotte and University of North Carolina-Wilmington, and mass distribution through list-serves at North Carolina State University and University of North Carolina Chapel Hill.

Data collection resulted in 182 responses from a possible 3,429 students who were sent an invitation to participate, a 5% response rate. Of the population who responded, 67 self-identified as Hispanic, 37%, and 115 as non-Hispanic, 67%, and 55 were males, 30%, and 127 Females, 70%.

Instrument

The Index of Learning Styles, ILS, is a 44 question instrument designed to assess preferences in 8 categories across 4 dimensions of learning styles: active or reflective, sensing or intuitive, visual or verbal, and sequential or global. These dimensions were highlighted in the Felder and Soloman (1991) learning style model and corresponded to a four core questions revolving around learning preferences:

1. What is the preference in information perception?
2. What is the preference in information reception?
3. What is the preference in information processing?
4. How does a person work toward understanding? (Felder & Brent, 2005, p. 60)

Felder and Soloman (1991) noted that in each dimension there are varying degrees of preference (p. 7). The variation is measured through answers to the items in each dimension. In the ILS each learning style dimension is associated with 11 forced choice items with responses corresponding to one or the other category of the dimension (Felder & Spurlin, 2005, p. 104). The difference between the responses for items in each dimension defined both the preference and degree of preference (Felder, 1993, Dimensional Learning Style ¶7).

Data on the Index of Learning Styles supported the instrument's validity and reliability as a statistically legitimate instrument for measuring learning style in educational settings (Zwyno, 2003). Although the instrument has not been utilized as frequently as other instruments like the MBTI, Kolb's LSI or Dunn and Dunn's PEP, the ILS has enough statistical psychometric support to its use in studies such as this one.

Research Questions and Hypotheses

Research Question 1: Is there a correlation in a student's learning style as measured by the Index of Learning Styles (ILS) and a student's ethnic identity as Hispanic or non-Hispanic?

Research Hypothesis 1a: There is a correlation in the Active/Reflective dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 1a: There is no significant correlation in the Active/Reflective dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Research Hypothesis 1b: There is a correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 1b: There is no significant correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Research Hypothesis 1c: There is a correlation in the Visual/Verbal dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 1c: There is no significant correlation in the Visual/Verbal dimension of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.

Research Hypothesis 1d: There is a correlation in the Sequential/Global dimension of learning as measured by the ILS based and a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 1d: There is no significant correlation in the Sequential/Global dimension of learning as measured by the ILS based and a student's ethnic identity as Hispanic or non-Hispanic.

Research Question 2: Is there a correlation in a student's learning style as measured by the Index of Learning Styles (ILS) and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender?

Research Hypothesis 2a: There is a correlation in the Active/Reflective dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Null-Hypothesis 2a: There is no significant correlation in the Active/Reflective dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Research Hypothesis 2b: There is a correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Null-Hypothesis 2b: There is no significant correlation in the Sensing/Intuitive dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Research Hypothesis 2c: There is a correlation in the Visual/Verbal dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Null-Hypothesis 2c: There is no significant correlation in the Visual/Verbal dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Research Hypothesis 2d: There is a correlation in the Sequential/Global dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Null-Hypothesis 2d: There is no significant correlation in the Sequential/Global dimension of learning as measured by the ILS and the interaction of college students' ethnic identification as Hispanic or non-Hispanic and gender.

Research Question 3: Is there a difference in a student's learning style as measured by the Index of Learning Styles, ILS, based on a student's ethnic identity as Hispanic or non-Hispanic?

Research Hypothesis 3a: There are differences in learning styles as measured by the Index of Learning Styles, ILS, based on a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 3a: There are no ILS mean differences based on a student's ethnicity.

Research Hypothesis 3b: There is a difference in the Active/Reflective dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 3b: There is no mean difference in the Active/Reflective dimension of learning as measured by the ILS based on a student's ethnicity.

Research Hypothesis 3c: There is a difference in the Sensing/Intuitive dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 3c: There is no mean difference in the Sensing/Intuitive dimension of learning as measured by the ILS based on a student's ethnicity.

Research Hypothesis 3d: There is a difference in the Visual/Verbal dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 3d: There is no mean difference in the Visual/Verbal dimension of learning as measured by the ILS based on a student's ethnicity.

Research Hypothesis 3e: There is a difference in the Sequential/Global dimension of learning as measured by the ILS based on a student's ethnic identity as Hispanic or non-Hispanic.

Null-Hypothesis 3e: There is no mean difference in the Sequential/Global dimension of learning as measured by the ILS based on a student's ethnicity.

Research Question 4: Are there differences in learning styles as measured by the ILS for college students identifying as Hispanic or non-Hispanic based on gender?

Research Hypothesis 4a: There are differences in learning styles as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Null-Hypothesis 4a: There are no differences in learning styles as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Research Hypothesis 4b: There is a difference between the preferences in the Active/Reflective dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Null-Hypothesis 4b: There are no mean differences between the preferences in the Active/Reflective dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Research Hypothesis 4c: There is a difference between the preferences in the Sensing/Intuitive dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Null-Hypothesis 4c: There are no mean differences between the preferences in the Sensing/Intuitive dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Research Hypothesis 4d: There is a difference between the preferences in the Visual/Verbal dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Null-Hypothesis 4d: There are no mean differences between the preferences in the Visual/Verbal dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Research Hypothesis 4e: There is a difference between the preferences in the Sequential/Global dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Null-Hypothesis 4e: There are no mean differences between the preferences in the Sequential/Global dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Data Analysis

Once learning styles were determined for each participant the results were analyzed with the assistance of the Nebraska Evaluation and Research Center using standard SAS and SPSS statistical software. A Pearson product moment correlation test along with the MANOVA and ANOVA testing was utilized in analysis.

Research Questions 1 and 2 revolved around the relationship between the four domains of the ILS and ethnic identity and the interaction of ethnicity and gender. This required a determination of the strength of the relationship between scores on the dimensional scales and the independent variables of ethnicity and gender. To test the strength of these relationships a Pearson product-moment correlation statistical analysis was completed. Correlation is a measure of the strength of a relationship between two variables. Correlation is reported from 0, representing a random relationship to 1 or -1, representative of a perfect relationship, either positive or negative (Garson, 2009a, ¶1). This r , or rho value, is calculated to show a linear relationship between two variables and

interpreted as the percent of variance explained by this relationship (McMillan & Schumacher, 2006, p. 485).

MANOVA, Multivariate Analysis, was used to determine the differences between ethnic identity, the interaction of gender and ethnicity, and ILS domain scores related to Research Questions 3 and 4. MANOVA, Multivariate Analysis of Variance, is a statistic which is used to “see the . . . effects of categorical variables on multiple dependent interval variables” (Garson, 2009b, ¶2). The categorical independent variables for which effects were measured were ethnicity, gender and ethnicity*gender interaction. The multiple dependent variables were the four dimensional scales of the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal and Sequential/Global.

As each learning style domain in the ILS represents a core area of learning style theory the importance of evaluating each domain using univariate testing was crucial (Felder & Brent, 2005, p. 60). Analysis of variance, or ANOVA, is used to “uncover the main and interaction effects of categorical independent variables on an interval dependent variable” (Garson, 2009c, ¶ 5)

Two-way ANOVA Analysis was done to test for effects of the categorical independent variables, gender, ethnicity and gender * ethnicity interaction on the interval dependent variables as measured by the linear dependent continua for each dimensional scales of the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal and Sequential/Global. Post-Hoc procedures were not required for each domain because there were on not more than two independent variables. ANOVA analysis was done to answer Research Questions 3 and 4.

To lend understanding to the results to Research Question 4, Estimated Means were calculated for scores on each of the ILS dimensional scales. Estimated Means assess the levels of a factor and interaction effects adjusting means for effects of covariates in the model, unlike multiple comparisons and post hoc tests (Garson, 2009c, Estimate Marginal Means, ¶1).

These mean differences were utilized in creating profile plots of the Estimated Mean to interpret the interaction of ethnicity and gender on ILS dimensional scale scores. The researcher chose to use Profile Plots of the Estimated Means for each of the ILS scales because such a plot allowed for a picture of the effect without the error, as opposed to plotting observed means which show both the effect and the error (SPSS Library, n.d., Profile Plots, ¶ 2). In such plots interaction is denoted by a crossing of the plot lines, the more parallel the lines the less significant the interaction (Seltman, 2010, p. 271). As mentioned, these profile or interaction plots were utilized in understanding to results of ANOVA tests in Research Question 4.

Additional Analysis

The researcher conducted a wave analysis on the four waves of responses collected. These waves were identified as: (a) Those received from an initial administration until the first reminder, 52 responses; (b) responses collected from the point of the first reminder until the third contact, 28 responses; (c) responses gathered from the point of the third contact until the final reminder, 70 responses; and (d) those collected after a fourth and final contact which emphasized the importance of the research, 32 responses. An ANOVA was used to compare the means for the Index of Learning Styles by response wave. A second ANOVA test was used to compare the

means for the Index of Learning Styles by response wave, ethnicity, gender and the interaction of gender and ethnicity. No significant differences were found.

Further analysis was done on the responses from the four institutions which participated in the study, University of North Carolina-Chapel Hill (UNC-CH), North Carolina State University (NCSU), The University of North Carolina-Wilmington (UNCW) and the University of North Carolina-Charlotte (UNCC). These campuses are within 200 miles of each other and have four of the higher undergraduate populations in the state, however, the campuses are not without differences. Academic programming, campus culture, admission requirements, student support services and residential housing services vary from campus to campus. These differences along with retention and graduation rates create institutional differences which may have lead to biases based on campus.

In order to protect against limitations related to biases associated with campus a MANOVA test was performed to determine if there were significant differences between responses from the four different campuses and ILS domain scores. The MANOVA test for differences showed no significant difference for responses based on campus.

Limitations

The researcher recognized four types of limitations present in this study. The first of these limitations stems from a low return rate and sample size. The study had a 5% return rate and a final number of 165 responses usable for analysis. The number of Hispanic college students who were accessible and attending state institutions in North Carolina combined with the challenges created by campus protocols in wide distributions of the instrument influenced this low number of responses. Although the low response

rate does create issues in general, a wave analysis was done to preclude non-response bias and minimize the limitation created by the low number of responses.

Additionally, the study was based on a volunteer sample and self reporting which could lead to the possibility of recall bias or bias based on social-economic status, race or other unknown or unstudied variables. The general population samples collected from list-serves and class lists were particularly troublesome as members of samples generated from these sources shared a common experience in terms of either the class or list-serve topic interest. Race and socio-economic class were not studied. Race was excluded because of the confusing aspects race shares with ethnicity. Socio-economic class was excluded because socio-economic class was beyond the scope of this study to identify the many contributing factors and affects of the concept. Neither of these exclusions affected the results of the primary variables being examined.

Furthermore, as data from each instrument were taken from an on-line survey with no IP address or other identifying feature collected, the study could include repeat responders and false, or “fake” responses that could have impacted the results.

Finally, the design of this study was cross-sectional rather than longitudinal and causal relationships cannot be inferred from the results of the analysis. Felder admitted that the preferences defined by the ILS “may change with time, and may vary from one subject or learning environment to another” (Felder, 1993, Dimensional Learning Style ¶7). Data were collected from students from four publicly funded institutions in the state of North Carolina in the last part of the first decade of the 21st century. Findings are limited to this population in this time only.

Summary of Findings

- The study identified a relationship between score on the Active/Reflective dimension scale of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic and gender.
- The study identified differences between the preferences in the Active/Reflective dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.
- Students, in general, were found to be more Active than Reflective on the Active/Reflective dimensional scale. Hispanic males and non-Hispanic Females had a greater tendency to be more Active.
- Estimate of means indicate a significant interaction effect on the differences between the preferences in the Active/Reflective dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.
- Students, in general, were found to be more Visual than Verbal on the Verbal/Visual dimensional scale. Male Hispanic students and female non-Hispanic students had an even greater Visual preference.
- Estimate of means indicate an interaction effect on the differences between the preferences in the Visual/Verbal dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.
- Both Hispanic and non-Hispanic female students and male non-Hispanic were found to be more Sequential than Global on the Sequential/Global

dimensional scale. Male Non-Hispanic students and female Hispanic students had an even greater Sequential preference.

- Estimate of means indicate an interaction effect on the differences between the preferences in the Sequential/Global dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.
- The study identified no relationship between learning styles as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.
- The study identified no relationship between score on the Active/Reflective dimension scale of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.
- The study identified no relationship between score on the Sensing/Intuitive dimension scale of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.
- The study identified no relationship between score on the Visual/Verbal dimension scale of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.
- The study identified no relationship between score on the Sequential/Global dimension scale of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic.
- The study identified no relationship between learning styles as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic and gender.

- The study identified no relationship between score on the Sensing/Intuitive dimension scale of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic and gender.
- The study identified no relationship between score on the Visual/Verbal dimension scale of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic and gender.
- The study identified no relationship between score on the Sequential/Global dimension scale of learning as measured by the ILS and a student's ethnic identity as Hispanic or non-Hispanic and gender.
- The study identified no differences in learning styles as measured by the ILS for students based on their ethnic identity as Hispanic or non-Hispanic.
- The study identified no difference between Hispanic or non-Hispanic students on the Active/Reflective dimension scale of learning as measured by the ILS.
- The study identified no difference between Hispanic or non-Hispanic students on the Sensing/Intuitive dimension of learning as measured by the ILS.
- The study identified no difference between Hispanic or non-Hispanic students on the Visual/Verbal dimension of learning as measured by the ILS.
- The study identified no difference between Hispanic or non-Hispanic students on the Sequential/Global dimension of learning as measured by the ILS.
- The study identified no differences in learning styles as measured by the ILS for student's identifying as Hispanic or non-Hispanic based on gender.

- The study identified no differences between the preferences in the Sensing/Intuitive dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.
- The study identified no significant differences between the preferences in the Visual/Verbal dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.
- The study identified no significant differences between the preferences in the Sequential/Global dimension of learning as measured by the ILS for students identifying as Hispanic or non-Hispanic based on gender.

Discussion

The researcher utilized the findings from the analysis of the data to answer the four research questions in this study.

Research Question 1: Is there a correlation in a student's learning style as measured by the Index of Learning Styles (ILS) and a student's ethnic identity as Hispanic or non-Hispanic? This study failed to identify a relationship between learning style and a student's ethnic identity. Specifically, no significant correlation was found between any of the four dimensions of the ILS and a student's ethnic identity as Hispanic or non-Hispanic. Although there are no directly corresponding studies, these findings contradict an early study on the impact of cultural influences on learning styles.

Ramirez and Cateneda (1974) argued that multi-cultural development was an important aspect of personality development and learning preferences (p. 27). To support their theory the authors looked at California children and developed tests for cognitive styles and explored the play between socialization practices and values of Anglo-

Americans and Mexican-Americans (p. 88). They found that the dual roles of a young person in a multi-cultural environment produced cognitive functioning with both internal and external orientations (p. 67, p. 153).

Although the Ramirez and Castanenda (1974) study was in a different time, a different geographic area and dealt with a different age group than this current study the Ramires and Cetenda (1974) study does raise questions about relationships between learning and ethnicity. Felder, noted that preferences on the ILS “may change with time, and may vary from one subject or learning environment to another” (1993, Dimensional Learning Style ¶7). One possible explanation for the differences of findings for this study as compared with the Ramirez and Castanenda (1974) study was that the dynamic nature of learning styles is responsive to how individuals respond to the environmental influences, and not as much to the environmental influences themselves.

Research Question 2: Is there a correlation in a student’s learning style as measured by the Index of Learning Styles (ILS) and the interaction of a college student’s ethnic identification as Hispanic or non-Hispanic and gender? There was a relationship found between a student’s learning style and the interaction of a college student’s ethnicity and gender. Specifically a significant correlation was found between the Active/Reflective dimension of learning and the interaction of a college student’s ethnic identification as Hispanic or non-Hispanic and gender. However, the study failed to show a significant correlation between the other three dimensions of learning measured by the ILS, Sensing/Intuitive, Visual/Verbal, and Sequential/Global, and the interaction of a college student’s ethnic identification as Hispanic or non-Hispanic and gender.

The relationship between learning style and gender alone was not part of the original research question as the findings were outside the scope of this study. However, the researcher compiled these results to show that the relationship between the Active/Reflective domain and interaction of ethnic identity and gender could not be explained, in full or in part, by a correlation between gender and ethnicity. Table 21 shows the results of the Pearson product moment analysis, with no significant relationship discovered between gender and other variables.

Table 21

Pearson Correlation-Gender

		Eth	Gen	E*G	ACT/ REF	SNS/ INT	VIS/ VER	SEQ/ GBL
Gender	Pearson Correlation	.018	1	.386**	-.032	.013	-.051	.054
	Sig. (2-tailed)	.815		.000	.688	.869	.512	.490
	N	165		165	165	165	165	165

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

This relationship between learning and the interaction of ethnicity and gender was echoed in the findings of Nora and Rendon (1990) who used direct discriminate function analysis to examine the relationship of gender and ethnicity to math and science preparation in six community colleges in the region along the Mexican/United States border. Their purpose was to find the best combination of predictor variables which maximize the difference between Hispanic and Euro-descendant community college

students in their math and science course-taking behavior and achievement. They found that external variables such as parental educational background and socioeconomic inequities impacted the preparation and ultimate success of Hispanic students (Nora & Rendon, 1990, Results, ¶5-8; Discussion, ¶1). Although, these findings are different in research structure than the findings in this study, they do reinforce the existence of the relationship between learning and ethnicity*gender interaction.

The relationship shown between the Active/Reflective learning style and the interaction of ethnicity and gender demonstrated how the interaction of ethnicity and gender is related to how information is processed. A student with an active learning preference retains and understands information best by discussing the information, applying the information or explaining the information to others while those with reflective preference prefer to think about information quietly before doing anything with the information (Felder & Soloman, 2001, p. 1). The relationship between these preferences and the ethnicity*gender interaction will give academic advisors, counselors, student support professionals and faculty valuable knowledge to assist students in achieving post-secondary educational success. Academic advisors and counselors can guide students to programs and classes that challenge students to perform at their highest capabilities yet are supportive of their learning preferences. Student support professionals can program for student success through programs that assist students in understanding learning style preferences and how to use them to succeed. Additionally, faculty can plan classes and tutoring sessions to deliver information in a manner that encourages both successful processing and challenges adaptability of the students in their classes.

Research Question 3: Is there a difference in a student's learning style as measured by the Index of Learning Styles (ILS) based on a student's ethnic identity as Hispanic or non-Hispanic? This study failed to find a significant difference in learning styles as measured by the Index of Learning Styles, ILS, based on a student's ethnic identity as Hispanic or non-Hispanic. Specifically, no significant difference of means on the four dimensional scales of learning as measured by the ILS, Active/Reflective, Sensing/Intuitive, Visual/Verbal, and Sequential/Global, was found between students identifying themselves as Hispanic and those identifying as non-Hispanic. Although there are no directly corresponding studies, these findings seem to contradict earlier studies on the impact of ethnic and cultural influences on learning styles.

Reid (1987) measured learning differences in students enrolled in English as a Second Language programs. ANOVA tests measured differences in six learning styles; visual, auditory, kinesthetic, tactile, group learning, and individual learning across age, language of origin, Test of English as a Foreign Language (TOEFL) score, length of time in the United States, length of time studying English, class and gender (p. 93). The most significant results came from the language of origins. Korean, Chinese and Arabic students showed divergent learning styles, while Spanish speaking students showed a definitive preference for kinesthetic and tactile learning (p. 96).

An earlier study by Lesser et al. (1965) looked at the cognitive differences in school aged children across four ethnic groups, Chinese, African-American, Puerto Rican, and Jewish; two socio-economic groups; lower and middle class; and gender. An

important finding was the pattern of mental abilities differed by socio-economic class and ethnicity (p. 73).

One possible explanation for the differences found in this study as compared to these previous studies is that learning differences may be related to other factors that are associated with, but not necessarily attributed to, ethnic identity. Gonzales and Roll (1985) suggested language differences and not cross-cultural cognitive differentiation was responsible for verbal performance differences found in a comparative study between Hispanic and non-Hispanic students in grades 4, 8, 12 and college freshmen in New Mexico (p. 201). They pointed to the absence of differences in non-verbal performance (p. 201). Similarly, Glick's (1975) experimental study suggested differences in visual responses from subjects in industrialized and nonindustrial societies came from categorical and functional associations (p. 635). As the current study focused on undergraduate students, the age and comprehension abilities of the subjects would weaken, if not negate, auxiliary influences like language and perception on a student's learning preferences.

The literature has shown both internal and external factors contribute to the experiences associated with the success and failure of Hispanic college students. Internal factors such as self-concept, motivation, and socialization (Kenny & McEachern, 2009; Padilla, 2006; Pidcock et al., 2001) and external factors, such as cultural norms, economic, and environmental barriers (Gonzalez et al., 2004; Hurtado & Ponjuan, 2005; Nora & Rendon, 1990; Wassmer et al., 2004) combine to affect a student's ability to be successful. While not contributing directly to learning, each factor had a significant influence on a student's the perception of higher education and higher educational

environments. These perceptions ultimately influenced their choice to continue their education and their ability to succeed in their efforts to do so.

Furthermore, the literature has shown that internalized cultural norms impact the individual educational experience of students (Manikutty et al., 2007; Sanchez, 2000; Vasquez, 1998). Common influences among students of Hispanic descent were family, community and communication. Family influences have been shown to impact everything from how far a student will take their education, what institution they will attend, and what they will study (Mina et al., 2004; Vasquez, 1990, 1998). Closely related to family is community, literature showed Hispanic students will seek out a community with similar values and beliefs to create a support system (Hernandez, 2000; Mina et al., 2004). As part of this support system extra value is placed on faculty and staff who can be seen as role models and who understand the culture (Mina et al., 2004; Vasquez, 1990, 1998). Finally, communication is a key component (Bohon et al., 2005; Rendon & Valadez, 1993; Vasquez, 1990, 1998). Communication in all aspects from institution to family, from teacher to student, and peer to peer, affected how a student processes the environment and how they view their experience. Ultimately, these factors will determine if a student is successful. The uniqueness of these influences and their universality among Hispanic students result in inherent challenges to educators.

A hypothesis of this study was that Hispanic ethnic identity had an impact on a student's learning preferences. Figure 11 highlights the absence of differences within the mean scores of the four ILS domains. The absence of differences in learning styles for Hispanic students as compared to their non-Hispanic counterparts showed that this

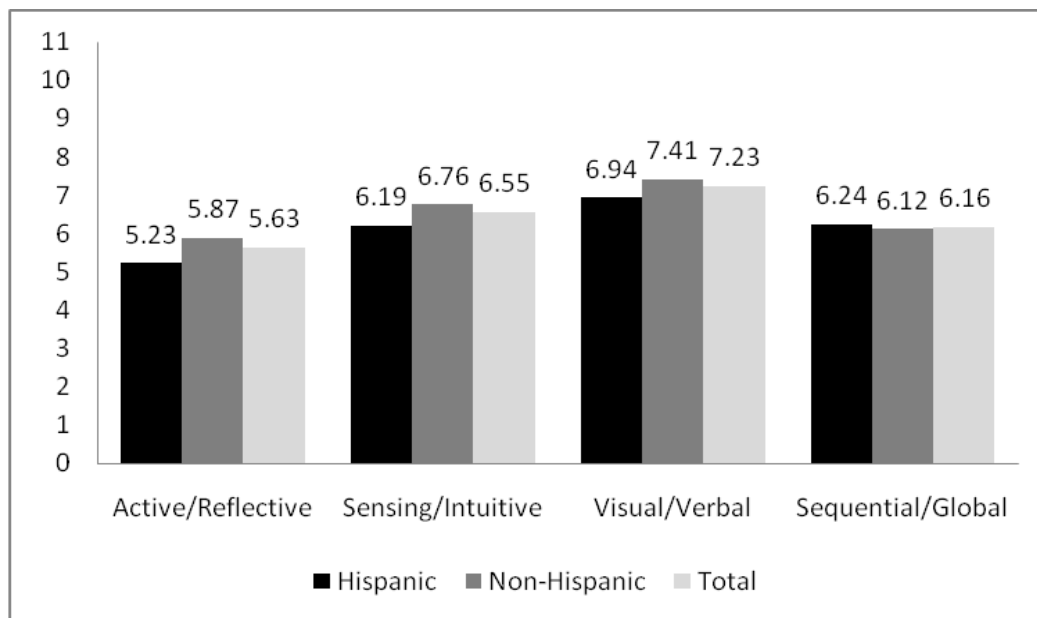


Figure 11. ILS mean scores by ethnicity.

sub-population had a similar diversity of learning preferences as other undergraduates. These findings support the notion that programs that help students to understand how they learn are important for all students.

Putting the findings of this study together with the findings in the literature a picture is developed that shows a disconnect between learning preferences and the ability to maximize learning to gain success in higher education. Although there is no difference in learning preferences based on ethnicity, there are significant differences in the ability of Hispanic students to access support which can assist them to utilize their learning preferences to succeed. Sound educational practice encourages student success across learning styles. Student affairs professionals, learning centers and academic counselors have programs that enhance the learning environment for all types of learners. This need for understanding of personal learning style combined with the challenges to academic

success created by ethnically based cultural influences cited in previous research point to the fact that Hispanic students need to be guided to these types of programs (Bohon et al., 2005; Gonzalez et al., 2004; Hernandez, 2000; Pidcock et al., 2001; Rendon & Valadez, 1993; Sanchez, 2000; Vasquez, 1998). These findings underlay the importance of student affairs departments to create and sustain programs that are supportive of other aspects of a student's life that may be influenced by ethnic identity and overcome the challenges that Hispanic students face in accessing these programs.

Research Question 4: Are there differences in learning styles as measured by the ILS for college students identifying as Hispanic or non-Hispanic based on gender? There was a difference in a student's learning style based on the interaction of a college student's ethnicity and gender. Specifically a significant difference was found on the Active/Reflective scale based on the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender. The study failed to show a significant difference on the other three dimensional scales of learning measured by the ILS, Sensing/Intuitive, Visual/Verbal, and Sequential/Global, based on the interaction of a college student's ethnic identification as Hispanic or non-Hispanic and gender. However, profile plots on estimated means showed interaction effects on the Visual/Verbal and Sequential/Global scales, Table 22.

The differences of learning style by gender alone were not part of the original research question as the findings were outside the scope of this study. However, the researcher compiled these results to show that the interaction effect on differences on the

Table 22

*Interaction Effect and Significance of Differences on ILS Scale by Ethnicity*Gender**Interaction*

ILS Domain	Profile Plot of Estimated Means Interaction Effect	Significance
Active/Reflective	+	+ *
Sensing/Intuitive		
Visual/Verbal	+	
Sequential/Global	+	

* $p < .05$

ILS dimensional scales could not be explained, in full or in part, by differences based on gender alone. Table 23 shows the results of the ANOVA analysis for gender, with no significant differences discovered between genders on the ILS.

A review of mean scores on the ILS revealed interesting, although not always significant, results in terms of the interaction effect of gender and ethnicity on mean scores on the ILS dimensional scales. Each ILS domain represents a linear dependent scale from 0-11, scores from 0-5.5 represent one categorical preference while 5.5-11 represent the opposing preference. The farther away from the 5.5 mid point represents a greater degree of preferences.

Table 23

ANOVA Between Groups Gender

Source	ILS Scale	SS	df	MS	F	Sig.
Gender	Act/Ref	3.985	1	3.985	.775	.38
	Sns/Int	3.075	1	3.075	.413	.52
	Vis/Ver	7.459	1	7.459	1.058	.31
	Seq/Gbl	6.114	1	6.114	1.312	.25
Wtihin Groups	Act/Ref	827.952	161	5.143		
	Sns/Int	1200.073	161	7.454		
	Vis/Ver	1134.856	161	7.049		
	Seq/Gbl	750.405	161	4.661		
Total	Act/Ref	6095.000	165			
	Sns/Int	8304.000	165			
	Vis/Ver	9789.000	165			
	Seq/Gbl	7037.000	165			

*p < .05

In the Active/Reflective dimensional scale, which showed a significant difference, the total population means were found to be more active than reflective, Figure 12.

However, the mean scores for Hispanic males and non-Hispanic females were found to be more active, to a higher degree, than either Hispanic females or non-Hispanic males.

This finding was supported by the profile plot of estimated means.

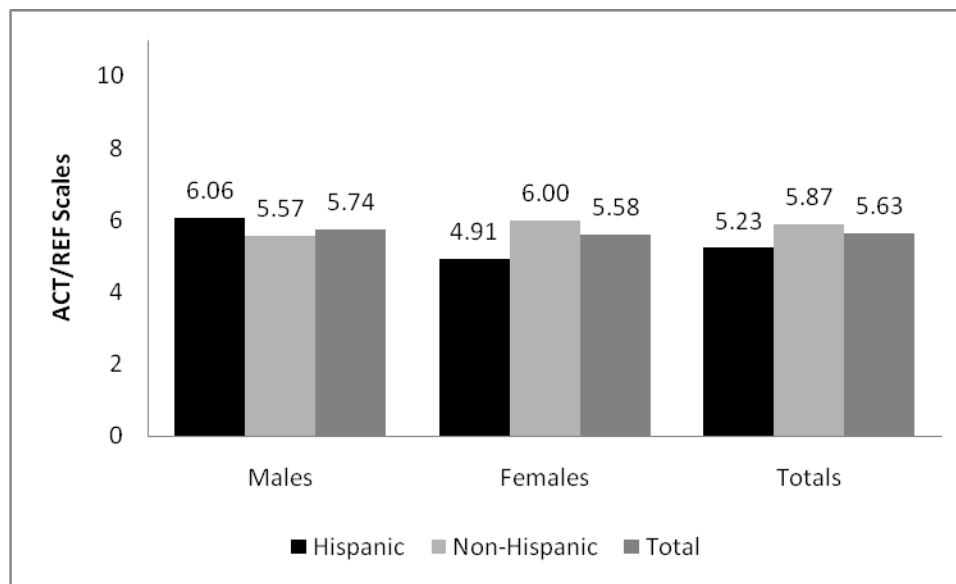


Figure 12. Mean scores on active/reflective scale.

A similar effect, although not found to be significant, was seen in scores on the Visual/Verbal scale, Figure 13. The population scores showed a definitive Verbal preference. However, the mean scores were higher, showing greater Visual preference for Hispanic males and non-Hispanic Females. This finding was supported by the profile plot of estimated means.

The Sequential/Global scale also showed an interaction effect that was not significant. The population scores, on the whole, showed a Sequential preference, Figure 14. However, the mean scores were higher with greater Sequential preference for Hispanic females and non-Hispanic males. This finding was supported by the profile plot of estimated means.

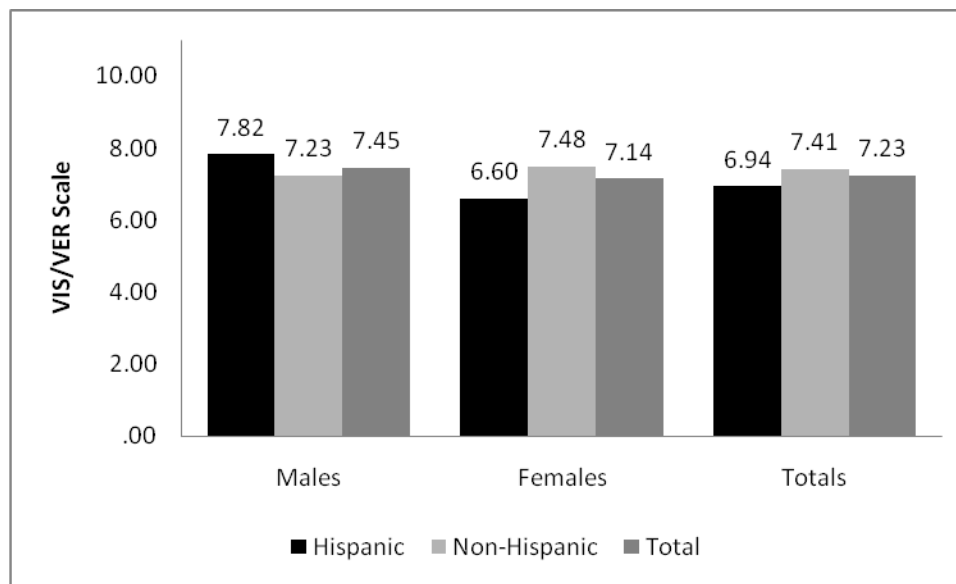


Figure 13. Mean score on visual/verbal scale.

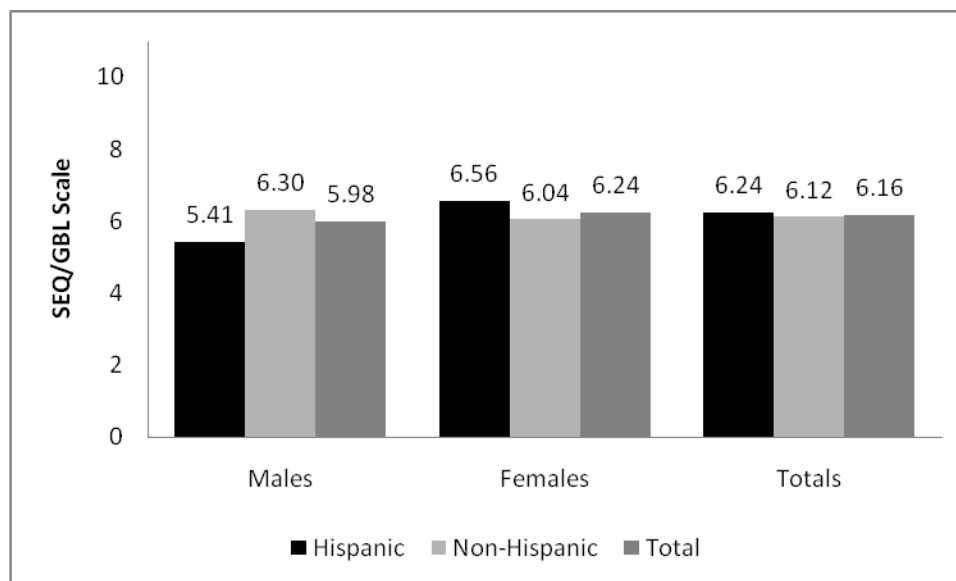


Figure 14. Mean scores on sequential/global scale.

These findings as they relate to the interaction of ethnicity and gender are informative for educators. The findings underscored the importance of programs that enhance a student's understanding of their personal learning preferences. Both academic

and student affairs administrators can utilize this information to support programs that assist students in understanding how they learn best and tools educators can employ to transfer this knowledge into academic success. Student learning centers and first year enhancement programs which provide access to learning style instruments like the ILS are examples of student centered programming, while faculty orientations and professional development seminars on teaching techniques and learning styles can assist educators.

The literature suggested creating learning environments which give students the resources to understand the influences on their learning preferences and the support to utilize this knowledge enhance the college experiences and lead students to success (Gradman & Hanania, 1991; Manikutty et al., 2007; Oxford, Ehrman & Levine, 1991; Tinto, 1997; Torres, 2006).

Manikutty et al. (2007) created a framework to understand cultural influences on learning approaches. Their framework layered components of learning and culture, and included deep/surface and apathetic/strategic learning approaches (p. 72), and cultural influences including individualism/collectivism, and masculinity/femininity (p. 74). Similarly, Gradman and Hanania (1991) and Oxford and Ehrman (1991) and Oxford, Ehrman, and Levine (1993) worked in successive studies to identify factors that impacted foreign language education. They identified, aptitude, motivation, anxiety, self-esteem, tolerance of ambiguity, risk taking, language, learning style, age and gender as the most important factors. These studies contended that matching pedagogical strategies to student learning styles could enhance achievement, attitudes and behavior in language classes (Oxford, Ehrman & Levine 1991; Oxford & Ehrman 1993).

While these studies focused on understanding, other literature focused on strategies that can be utilized to encourage success. In an examination of retention models for Hispanic students, Torres (2006) attended to the adaptations students made to be successful, and the influences on those adaptations (p. 310). Torres noted the importance of students creating cognitive maps of the college environment. The researcher noted the role educators could play in this endeavor by avoiding practices that placate to or disavow a student's relationship with their cultural values (p. 316) and creating mechanisms that assist a student in modifying those relationships in a way that benefited the student in the future.

Tinto (1997) examined learning communities which used collaborative learning strategies (p. 600). Tinto noted the positive effects of manufactured educational environments on student effort and persistence (p. 615). Similarly, Sanchez (2000) advocated for environments which take advantage of the cultural propensity for community found in Hispanic learners by utilizing community-centered learning environments. Although Sanchez warned about the dangers of developing stereotypes based on individual profiles and group preferences, she noted that learning communities, like the shared knowledge learning community described by Tinto, provided support and engagement that encouraged both group and individual success.

Conclusion

Every student has strengths and preferences in how they intake and process information, they have their own learning style. Felder noted "functioning effectively in any professional capacity requires working well in all learning style models" (Felder, 1996, p. 18). He further noted that if an educational environment is focused only on a

less preferred style then this could interfere with learning. However, if an educational environment is focused only on a preferred style then the “mental dexterity” essential to success will be impeded (p.18). The University of North Carolina stated its mission is:

discover, create, transmit, and apply knowledge to address the needs of individuals and society. This mission is accomplished through instruction, which communicates the knowledge and values and imparts the skills necessary for individuals to lead responsible, productive, and personally satisfying lives; through research, scholarship, and creative activities, which advance knowledge and enhance the educational process; and through public service, which contributes to the solution of societal problems and enriches the quality of life in the State. (The University of North Carolina, n.d., History and Mission, ¶ 16)

In order to accomplish this mission, institutions must develop competency across a variety of learning styles, both those styles which are more preferred and those less preferred, for all students.

Pascarella and Terenzini (1991) noted that “developmental movement originates in a challenge to the current state of development” (p. 45). This idea was echoed by Mina et al. (2004) as they described how understanding and motivation provided by Hispanic staff and faculty inspired them to succeed in their higher education endeavors and become educators themselves (p. 86). The concept of addressing students on their own level to move them further developmentally was additionally echoed by Felder and Henriques (1995) as they suggested a multi-style approach to education (p. 28). They noted that an instructor will usually be teaching in a style that is preferred by several types of learners. Balancing this with strategies that employ variations of presentations and use of inductive and deductive techniques in a manner that is comfortable for the instructor and effective for students can greatly enhance the results of all learners in a class (p. 29).

These sentiments echo those of Chickering and Gamson (1987) as they specified respect for “diverse talents and ways of learning” as a key principle of undergraduate education. In their words, “Students need the opportunity to show their talents and learn in ways that work for them. Then they can be pushed to learn in new ways that do not come so easily.”(Chikering and Gamson, 1987, Seven Principles of Good Practice ¶23). This research suggested that Hispanic learners are no different than other learners with respect to their learning preferences. When researchers like Manikutty et al. (2007), Felder and Henriques (1995), Torres (2006), Tinto (1997), Reid (1987), and Sanchez (2000) suggested that flexibility based on understanding the learner’s style is the key to educational planning and success in trans-cultural learning environments, it is true for all learners, Hispanic and non-Hispanic alike.

The findings in this research suggested that learning style is a very personal characteristic which may have a variety of influences; the interaction of these influences leads to these personal preferences. In the following section the researcher will examine the possibilities of future practice and research that can build on these findings.

Recommendations for Future Practice and Research

Recommendations for Future Practice. Qualitative research in the literature on the subject of Hispanic student success has given institutions a variety of strategies to enhance the success of students.

One such strategy which has been adopted by some is to alter-pedagogical style to adapt to the changing population, sometimes referred to as “equity pedagogy” (Banks, 2004, p. 18). Often this takes the form of altering instructional techniques in an attempt to maximize successes of minority students (p. 18). This practice stems from what Banks

(2004) refers to as the “Cultural Difference” theories initiated in the 1970’s which postulated that minority students struggle to achieve academic success because of cultural conflicts experienced in schools (p. 19). While this also seems to be basis for multi-cultural development theories such as Ramirez and Cateneda’s (1974) argument that multi-cultural development was an important aspect of personality development and learning preferences (p. 27). However they note personalizing information and accepting individual ideas and encouraging cooperation (pp. 179-181) combine to have positive and practical influence on learning.

This research has found no significant difference in learning styles for Hispanic and non-Hispanic students. Thus for teachers need to understand the role of learning styles in their classrooms. While learning styles can be a good tool for self-assessment and personal success, their use for broader based pedagogical programming should be undertaken with caution. Faculty and institutions should promote personal understanding and teaching toward a diversity of learning styles (Chikering and Gamson, 1987); the findings in this research suggested that if learning styles are to be used as a tool then the focus should stay on individuals and not a particular sub-population.

The literature has been clear that the key to utilizing learning styles to enhance student success in learning environments is the ability of the individual to understand their own learning style (Felder & Henriques, 1995; Manikutty et al., 2007; Reid, 1987; Sanchez, 2000; Tinto, 1997). Additionally, literature suggested student involvement in this process is desired (Dunn & Dunn, 1975; Hilgeron-Volk, 1987; McCarthy & Schmeck, 1988). Hilgeron-Volk (1987) suggested that “becoming aware of how we best learn . . . makes learning more enjoyable and creative” because students can take

advantage of their strengths to become more independent learners (p. 23). Teaching this type of awareness and the tools to use the awareness can come in many forms. First Year Experience courses at institutions across the country have included lessons on learning styles, study skills, academic skills and critical thinking as a common part of the curriculum (National Resource Center, 2009). Additionally, learning centers and academic skill centers routinely use learning style testing as part of their support programming (Kelly, 2007). A good example of this can be seen at Dartmouth College where The Academic Skills Center uses the ILS as part of a program to enhance student's academic experience (Dartmouth College, 2011, ¶ 1).

Furthermore, the results of this study suggested that making assumptions about learning style based on cultural factors, such as ethnic identity, is unwarranted and can lead to misguided approaches. While institutions should recognize and understand the diversity of students it is equally important to understand what this diversity does and does not mean. Many influences factor into a student's learning style, creating environments that allow students to recognize this in themselves and challenge them to utilize their strengths and learn new approaches to succeed requires flexibility from faculty and administrators.

Recommendations for Future Research. While this research produced findings that allow us to understand the interplay of learning styles and ethnicity these findings also created a new set of questions to explore. The lack of quantitative research in the literature dictates more research using quantitative techniques needs to be considered to further the understanding of ethnic influences on student learning. However, the use of qualitative and mixed methodologies should also be employed to gain a deeper

understanding of the Hispanic sub-population in our institutions of higher learning. Research using innovative frameworks which layer learning and cultural influences, such as the one presented by Manikutty et al. (2007), could be useful in creating practical applications. Using a variety of methodologies could also lead to a greater response sample and will give us greater perspective.

Much of the literature is based geographically in areas with historical Hispanic influences, South Florida, Texas and California. Additionally, many of the existing studies focus on the community college setting. Research on learning styles is needed with larger populations of Hispanic students across a wider geographic area and within different types of educational institutions. This research study was focused on four public mid-sized to large research focused institutions in North Carolina. Similar research with students in a variety of settings may yield interesting and perhaps different findings. Additionally, results from a larger sample would allow for greater generalization of the findings.

Additional research is also needed cross-culturally. This research showed no significant differences between the Hispanic students and other students. This finding leads to the additional question, are there differences in learning style based on other racial and ethnic sub-populations? Further exploration into other sub-populations could give greater insight into the factors that influence student learning. Additionally, the findings of this research, related to the interaction effects of gender and ethnic identity, show a need for further exploration into the extent and meaning of such effects. Exploring interaction effects of other intervening variables within and across student sub-populations could be used to determine if and the extent of the impact of other influences

on student learning preferences. Examples of other influences are: national origin, legal residency status, language competency, geographic location, generational education and socio-economic status. Furthermore, the literature alluded to other factors such as campus housing, academic major and campus involvement that could add additional interaction effects (Bohon et al., 2005; Dunn & Dunn, 1975; Hilgeron-Volk, 1987; McCarthy & Schmeck, 1988; Tinto, 1997). These same influences could be studied cross-culturally to gain a greater scope of understanding of student learning.

Summary

This research study has focused on personal learning style and the success of Hispanic college students. The findings of this research, while not absolute, suggest that there is no difference in learning style based on ethnicity, yet the fact still remains that there is a disparity in success of Hispanic students and the general population. Although this is one of many possible learning instruments available and the population sample was limited, programming based on ethnicity appears not as effective as programming that allows flexibility for individual differences. To this end practical application of the findings from this study could include programming that enhances personal understanding of learning styles and creates connections for Hispanic students to access and utilize this information in their learning.

Programs that seek to enhance student success and understanding like those offered through first year experience classes and learning centers, are not enough; students must take part in the programs in a substantive manner in order to gain the knowledge, understanding and skills which these programs try to impart. The literature has been clear that there are cultural influences that impact Hispanic college student

success (Bohon et al., 2005; Gonzalez et al., 2004; Hernandez, 2000; Pidcock et al., 2001; Rendon and Valadez, 1993; Sanchez, 2000; Vasquez, 1998). Creating methods that connect the Hispanic student to the programs that will give them the best chance of succeeding becomes imperative. These connections may be made informally through faculty and staff role models who share Hispanic heritage or naturally forming student support groups. Or they can be made more formally through diversity enhancement programs, shared interest groups, student organizations and defined learning communities.

Intentional programs that connect Hispanic students to academic enhancement programs have shown success and are likely to be important as the Hispanic population continues to grow (Cejda & Hoover, 2009; Laden, 1992, 1998). Programs like The Puente Project, a California program which partners community colleges and the University of California in an effort to encourage continuation of college education for Hispanic students, have had profound success (Laden, 1998, p. 14). “The Puente Project,” which has been in existence since 1981, uses “rigorous language arts instruction, sustained academic counseling (including instruction in learning strategies and college skills development), and mentoring by members” to prepare and sustain motivation and ability in Hispanic students (Puente, n.d., Program History, ¶ 2).

Laden (1998) conducted a study that showed that students involved in The Puente Project gained “pedagogical and transformative experiences” that raised their academic and professional goals, and perhaps more importantly, their self-esteem and cultural pride (p. 5). Empirical data shows a 97% retention rate for community college students

involved in the project, and transfer rates of 86% continuing at either the University of California system or California State Universities (p. 14).

The findings in this study allude to the need for more programs, like The Puente Project, that intentionally focus multi-layers of support to encourage Hispanic students to access and utilize the tools they need to succeed.

This study sought to inform the understanding of the impact of ethnic identity and learning and to increase the knowledge base of learning styles, cultural differentiation, and educational practice. These findings should generate discussion and debate on the cultural influences on learning and general influences on the success of Hispanic college students. However, the most important aspect of this research was that the findings may serve to inform programming and practice in higher education as society strives to strengthen the inclusiveness of our universities and the success of students from diverse backgrounds.

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Appendix A

Instrument as presented on Survey Monkey™

Learning Style Differentiation in NC

1. Informed Consent

Identification of Project:

Learning Style Differentiation in Hispanic College Students in Selected Institutions in the North Carolina Public University System
(IRB#20100210139 EX)

Purpose of the Research:

The purpose of this study is to determine if there are discernable, quantifiable differences of learning styles for undergraduate Hispanic students as compared to non-Hispanic undergraduate students. The study will quantifiably categorize learning preferences using Felder and Soloman's Index of Learning Styles, or ILS (1991). This information will be utilized to make recommendations on methodological strategies for educational activities, services and environments that address the learning needs of the Hispanic population who attend state-funded, or "public", post-secondary education in the state.

You must be 18 years of age or older to participate. You are invited to participate in this study because you are a student attending one of four selected institutions in the University of North Carolina system, North Carolina State University, University of North Carolina-Chapel Hill, University of North Carolina-Wilmington and University of North Carolina-Charlotte.

Procedures:

Participation in this study will require approximately 10 minutes of your time, and is not considered as part of any university requirement. The questionnaire to be completed is furnished on "Survey Monkey". The questionnaire is based on an instrument called the Index of Learning Styles, developed by Richard Felder at North Carolina State University. There is a short section for recording demographics and then a 44 item questionnaire that asks you as a respondent to give your preferences in learning situations.

The project is concerned with learning styles, or learning preferences, of undergraduate students and how these may be related to the student's ethnic heritage.

Risks and/or Discomforts:

There are no known risks or discomforts associated with this research.

Benefits:

You may find the learning experience enjoyable and the information may be helpful to you as you think about how you best learn. The study is important because it will help educators to better understand the needs of students and will assist them in providing more effective learning experiences.

Alternatives:

If you do not want to take part in the study you may simply exit the Survey Monkey window on your computer. If you would still be interested in taking the Index of Learning Styles and not participating in this study you can go to <http://www.engr.ncsu.edu/learningstyles/ilsweb.html>.

Confidentiality:

The data will be collected through Survey Monkey. It will be sent to a secure server and encrypted while in transit. The researcher will not be collecting IP addresses. Although each individual instrument will be scored separately, analysis will be done on the combined results with no identifying reference to the individual completing the instrument.

Any information inadvertently obtained during this study which could identify you will be kept strictly confidential. The data will be stored in a locked cabinet in the investigator's office and will only be seen by the investigator during the study and for no more than two years after the study is complete.

The information obtained in this study may be published in scientific journals or presented at scientific meetings but the data will be reported as aggregated data.

Compensation:

There will be no compensation for participating in this research.

Learning Style Differentiation in NC

Opportunity to Ask Questions:

You may ask any questions concerning this research and have those questions answered before agreeing to participate in or during the study. You may contact the investigator or secondary investigator at any time. Contact information for the primary investigator, Robert Tripp, is (910) 599-1340, office phone, and e-mail, rtripp@nchousing.org. The secondary investigator, Dr. Richard Hoover, may be reached at (402) 472-3058, office phone, and e-mail, rhoover2@unl.edu. If you have any questions about your rights as a research participant, or to report any concerns about the study, you may contact the University of Nebraska-Lincoln Institutional Review Board at (402) 472-6965.

Freedom to Withdraw:

Participation in this study is voluntary. You can refuse to participate or withdraw at any time without harming your relationship with the researchers, the University of North Carolina-Chapel Hill, the University of North Carolina-Charlotte, North Carolina State University, the University of North Carolina-Wilmington, or the University of Nebraska-Lincoln, or in any other way receive a penalty or loss of benefits to which you are otherwise entitled.

Consent, Right to Receive a Copy:

You are voluntarily making a decision whether or not to participate in this research study. By completing the instrument and clicking the submit button on the Survey Monkey questionnaire you are certifying that you have decided to participate having read and understood the information presented. You may print a copy of this consent for your records.

Name and Phone number of investigator(s)

Robert Tripp, MS, Principal Investigator Office: (910) 599-1340

Richard Hoover, PhD, Graduate Supervisor for Primary Investigator Office: (402) 472-3058

Copyright © 1991, 1994 by North Carolina State University (Authored by Richard M. Felder and Barbara A. Soloman). For information about appropriate and inappropriate uses of the Index of Learning Styles and a study of its reliability and validity, see <http://www.ncsu.edu/felder-public/ILSpage.html>.

Learning Style Differentiation in NC

2. Demographics

1. Campus:

- ☐ North Carolina State University
- ☐ University of North Carolina Chapel Hill
- ☐ University of North Carolina Charlotte
- ☐ University of North Carolina Wilmington
- ☐ Other (please specify)

2. Year in School:

- ☐ Freshman
- ☐ Sophomore
- ☐ Junior
- ☐ Senior

3. Ethnicity:

For the purposes of the study “ethnicity” is defined using United States governmental terminology, “Hispanic” and “non-Hispanic”. Furthermore, the term “Hispanic” is defined as “A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race. The term, “Spanish origin,” can be used in addition to “Hispanic” or “Latino.” (Federal Register. (1997) Standards for Maintaining, Collecting, and Presenting Federal Data on Race and Ethnicity. (Retrieved on April 14, 2009 from the world wide web at http://www.whitehouse.gov/omb/inforeg/re_app-a-update.pdf)

- ☐ Hispanic
- ☐ Non-Hispanic

4. Gender:

- ☐ Male
- ☐ Female

Learning Style Differentiation in NC**5. Age:**

- ☐ 18 and under
- ☐ 19-21
- ☐ 22-25
- ☐ 25 and older

Learning Style Differentiation in NC**3. Index of Learning Styles**

Enter your answers to every question on the ILS scoring sheet. Please choose only one answer for each question. If both "a" and "b" seem to apply to you, choose the one that applies more frequently.

1. I understand something better after I

- ☐ a) try it out.
- ☐ b) think it through.

2. I would rather be considered

- ☐ a) realistic.
- ☐ b) innovative.

3. When I think about what I did yesterday, I am most likely to get

- ☐ a) a picture.
- ☐ b) words.

4. I tend to

- ☐ a) understand details of a subject but may be fuzzy about its overall structure.
- ☐ b) understand the overall structure but may be fuzzy about details.

5. When I am learning something new, it helps me to

- ☐ a) talk about it.
- ☐ b) think about it.

6. If I were a teacher, I would rather teach a course

- ☐ a) that deals with facts and real life situations.
- ☐ b) that deals with ideas and theories.

7. I prefer to get new information in

- ☐ a) pictures, diagrams, graphs, or maps.
- ☐ b) written directions or verbal information.

8. Once I understand

- ☐ a) all the parts, I understand the whole thing.
- ☐ b) the whole thing, I see how the parts fit.

Learning Style Differentiation in NC

9. In a study group working on difficult material, I am more likely to

- ☐ a) jump in and contribute ideas.
- ☐ b) sit back and listen.

10. I find it easier

- ☐ a) to learn facts.
- ☐ b) to learn concepts.

11. In a book with lots of pictures and charts, I am likely to

- ☐ a) look over the pictures and charts carefully.
- ☐ b) focus on the written text.

12. When I solve math problems

- ☐ a) I usually work my way to the solutions one step at a time.
- ☐ b) I often just see the solutions but then have to struggle to figure out the steps to get to them.

13. In classes I have taken

- ☐ a) I have usually gotten to know many of the students.
- ☐ b) I have rarely gotten to know many of the students.

14. In reading nonfiction, I prefer

- ☐ a) something that teaches me new facts or tells me how to do something.
- ☐ b) something that gives me new ideas to think about.

15. I like teachers

- ☐ a) who put a lot of diagrams on the board.
- ☐ b) who spend a lot of time explaining.

16. When I'm analyzing a story or a novel

- ☐ a) I think of the incidents and try to put them together to figure out the themes.
- ☐ b) I just know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.

Learning Style Differentiation in NC**17. When I start a homework problem, I am more likely to**

- ☐ a) start working on the solution immediately.
- ☐ b) try to fully understand the problem first.

18. I prefer the idea of

- ☐ a) certainty.
- ☐ b) theory.

19. I remember best

- ☐ a) what I see.
- ☐ b) what I hear.

20. It is more important to me that an instructor

- ☐ a) lay out the material in clear sequential steps.
- ☐ b) give me an overall picture and relate the material to other subjects.

21. I prefer to study

- ☐ a) in a study group.
- ☐ b) alone.

22. I am more likely to be considered

- ☐ a) careful about the details of my work.
- ☐ b) creative about how to do my work.

23. When I get directions to a new place, I prefer

- ☐ a) a map.
- ☐ b) written instructions.

24. I learn

- ☐ a) at a fairly regular pace. If I study hard, I'll "get it."
- ☐ b) in fits and starts. I'll be totally confused and then suddenly it all "clicks."

25. I would rather first

- ☐ a) try things out.
- ☐ b) think about how I'm going to do it.

Learning Style Differentiation in NC

26. When I am reading for enjoyment, I like writers to

- ☐ a) clearly say what they mean.
- ☐ b) say things in creative, interesting ways.

27. When I see a diagram or sketch in class, I am most likely to remember

- ☐ a) the picture.
- ☐ b) what the instructor said about it.

28. When considering a body of information, I am more likely to

- ☐ a) focus on details and miss the big picture.
- ☐ b) try to understand the big picture before getting into the details.

29. I more easily remember

- ☐ a) something I have done.
- ☐ b) something I have thought a lot about.

30. When I have to perform a task, I prefer to

- ☐ a) master one way of doing it.
- ☐ b) come up with new ways of doing it.

31. When someone is showing me data, I prefer

- ☐ a) charts or graphs.
- ☐ b) text summarizing the results.

32. When writing a paper, I am more likely to

- ☐ a) work on (think about or write) the beginning of the paper and progress forward.
- ☐ b) work on (think about or write) different parts of the paper and then order them.

33. When I have to work on a group project, I first want to

- ☐ a) have "group brainstorming" where everyone contributes ideas.
- ☐ b) brainstorm individually and then come together as a group to compare ideas.

Learning Style Differentiation in NC

34. I consider it higher praise to call someone

- ☐ a) sensible.
- ☐ b) imaginative.

35. When I meet people at a party, I am more likely to remember

- ☐ a) what they looked like.
- ☐ b) what they said about themselves.

36. When I am learning a new subject, I prefer to

- ☐ a) stay focused on that subject, learning as much about it as I can.
- ☐ b) try to make connections between that subject and related subjects.

37. I am more likely to be considered

- ☐ a) outgoing.
- ☐ b) reserved.

38. I prefer courses that emphasize

- ☐ a) concrete material (facts, data).
- ☐ b) abstract material (concepts, theories).

39. For entertainment, I would rather

- ☐ a) watch television.
- ☐ b) read a book.

40. Some teachers start their lectures with an outline of what they will cover. Such outlines are

- ☐ a) somewhat helpful to me.
- ☐ b) very helpful to me.

41. The idea of doing homework in groups, with one grade for the entire group,

- ☐ a) appeals to me.
- ☐ b) does not appeal to me.

Learning Style Differentiation in NC**42. When I am doing long calculations,**

- ☐ a) I tend to repeat all my steps and check my work carefully.
- ☐ b) I find checking my work tiresome and have to force myself to do it.

43. I tend to picture places I have been

- ☐ a) easily and fairly accurately.
- ☐ b) with difficulty and without much detail.

44. When solving problems in a group, I would be more likely to

- ☐ a) think of the steps in the solution process.
- ☐ b) think of possible consequences or applications of the solution in a wide range of areas.

Appendix B

Index of Learning Styles

INDEX OF LEARNING STYLES*

DIRECTIONS

Enter your answers to every question on the ILS scoring sheet. Please choose only one answer for each question. If both “a” and “b” seem to apply to you, choose the one that applies more frequently.

1. I understand something better after I
 - a) try it out.
 - b) think it through.
2. I would rather be considered
 - a) realistic.
 - b) innovative.
3. When I think about what I did yesterday, I am most likely to get
 - a) a picture.
 - b) words.
4. I tend to
 - a) understand details of a subject but may be fuzzy about its overall structure.
 - b) understand the overall structure but may be fuzzy about details.
5. When I am learning something new, it helps me to
 - a) talk about it.
 - b) think about it.
6. If I were a teacher, I would rather teach a course
 - a) that deals with facts and real life situations.
 - b) that deals with ideas and theories.
7. I prefer to get new information in
 - a) pictures, diagrams, graphs, or maps.
 - b) written directions or verbal information.
8. Once I understand
 - a) all the parts, I understand the whole thing.
 - b) the whole thing, I see how the parts fit.
9. In a study group working on difficult material, I am more likely to
 - a) jump in and contribute ideas.
 - b) sit back and listen.

* Copyright © 1991, 1994 by North Carolina State University (Authored by Richard M. Felder and Barbara A. Soloman). For information about appropriate and inappropriate uses of the Index of Learning Styles and a study of its reliability and validity, see <<http://www.ncsu.edu/felder-public/ILSpage.html>>.

10. I find it easier
 - a) to learn facts.
 - b) to learn concepts.
11. In a book with lots of pictures and charts, I am likely to
 - a) look over the pictures and charts carefully.
 - b) focus on the written text.
12. When I solve math problems
 - a) I usually work my way to the solutions one step at a time.
 - b) I often just see the solutions but then have to struggle to figure out the steps to get to them.
13. In classes I have taken
 - a) I have usually gotten to know many of the students.
 - b) I have rarely gotten to know many of the students.
14. In reading nonfiction, I prefer
 - a) something that teaches me new facts or tells me how to do something.
 - b) something that gives me new ideas to think about.
15. I like teachers
 - a) who put a lot of diagrams on the board.
 - b) who spend a lot of time explaining.
16. When I'm analyzing a story or a novel
 - a) I think of the incidents and try to put them together to figure out the themes.
 - b) I just know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.
17. When I start a homework problem, I am more likely to
 - a) start working on the solution immediately.
 - b) try to fully understand the problem first.
18. I prefer the idea of
 - a) certainty.
 - b) theory.
19. I remember best
 - a) what I see.
 - b) what I hear.
20. It is more important to me that an instructor
 - a) lay out the material in clear sequential steps.
 - b) give me an overall picture and relate the material to other subjects.
21. I prefer to study
 - a) in a study group.
 - b) alone.

22. I am more likely to be considered
 - a) careful about the details of my work.
 - b) creative about how to do my work.
23. When I get directions to a new place, I prefer
 - a) a map.
 - b) written instructions.
24. I learn
 - a) at a fairly regular pace. If I study hard, I'll "get it."
 - b) in fits and starts. I'll be totally confused and then suddenly it all "clicks."
25. I would rather first
 - a) try things out.
 - b) think about how I'm going to do it.
26. When I am reading for enjoyment, I like writers to
 - a) clearly say what they mean.
 - b) say things in creative, interesting ways.
27. When I see a diagram or sketch in class, I am most likely to remember
 - a) the picture.
 - b) what the instructor said about it.
28. When considering a body of information, I am more likely to
 - a) focus on details and miss the big picture.
 - b) try to understand the big picture before getting into the details.
29. I more easily remember
 - a) something I have done.
 - b) something I have thought a lot about.
30. When I have to perform a task, I prefer to
 - a) master one way of doing it.
 - b) come up with new ways of doing it.
31. When someone is showing me data, I prefer
 - a) charts or graphs.
 - b) text summarizing the results.
32. When writing a paper, I am more likely to
 - a) work on (think about or write) the beginning of the paper and progress forward.
 - b) work on (think about or write) different parts of the paper and then order them.
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 - a) have "group brainstorming" where everyone contributes ideas.
 - b) brainstorm individually and then come together as a group to compare ideas.

- 34. I consider it higher praise to call someone
 - a) sensible.
 - b) imaginative.
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- 36. When I am learning a new subject, I prefer to
 - a) stay focused on that subject, learning as much about it as I can.
 - b) try to make connections between that subject and related subjects.
- 37. I am more likely to be considered
 - a) outgoing.
 - b) reserved.
- 38. I prefer courses that emphasize
 - a) concrete material (facts, data).
 - b) abstract material (concepts, theories).
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 - a) watch television.
 - b) read a book.
- 40. Some teachers start their lectures with an outline of what they will cover. Such outlines are
 - a) somewhat helpful to me.
 - b) very helpful to me.
- 41. The idea of doing homework in groups, with one grade for the entire group,
 - a) appeals to me.
 - b) does not appeal to me.
- 42. When I am doing long calculations,
 - a) I tend to repeat all my steps and check my work carefully.
 - b) I find checking my work tiresome and have to force myself to do it.
- 43. I tend to picture places I have been
 - a) easily and fairly accurately.
 - b) with difficulty and without much detail.
- 44. When solving problems in a group, I would be more likely to
 - a) think of the steps in the solution process.
 - b) think of possible consequences or applications of the solution in a wide range of areas.

ILS SCORING SHEET

1. Put "1"s in the appropriate spaces in the table below (e.g. if you answered "a" to Question 3, put a "1" in Column A by Question 3).
2. Total the columns and write the totals in the indicated spaces.
3. For each of the four scales, subtract the smaller total from the larger one. Write the difference (1 to 11) and the letter (a or b) for which the total was larger on the bottom line.

For example, if under "ACT/REF" you had 4 "a" and 7 "b" responses, you would write "3b" on the bottom line under that heading..

4. On the next page, mark "X"s above your scores on each of the four scales.

ACT/REF			SNS/INT			VIS/VRB			SEQ/GLO		
Q	a	b	Q	a	b	Q	a	b	Q	a	b
1	___	___	2	___	___	3	___	___	4	___	___
5	___	___	6	___	___	7	___	___	8	___	___
9	___	___	10	___	___	11	___	___	12	___	___
13	___	___	14	___	___	15	___	___	16	___	___
17	___	___	18	___	___	19	___	___	20	___	___
21	___	___	22	___	___	23	___	___	24	___	___
25	___	___	26	___	___	27	___	___	28	___	___
29	___	___	30	___	___	31	___	___	32	___	___
33	___	___	34	___	___	35	___	___	36	___	___
37	___	___	38	___	___	39	___	___	40	___	___
41	___	___	42	___	___	43	___	___	44	___	___
Total (sum X's in each column)											
ACT/REF			SNS/INT			VIS/VRB			SEQ/GLO		
a b			a b			a b			a b		
___			___			___			___		
(Larger – Smaller) + Letter of Larger (see below)*											
___			___			___			___		

*Example: If you totaled 3 for a and 8 for b, you would enter 5b in the space below.

Transfer your scores to the ILS report form by placing X's at the appropriate locations on the four scales.

Appendix C

Approval from Instrument Author



Appendix D

Non-Coercion Statements

University of North Carolina-Charlotte

Learning Style Differentiation in Hispanic College Students in Selected Institutions in the North Carolina Public University System**Institutional Representatives Roles and Responsibilities:**

- Assist the researcher in navigating the IRB process and protocols for my institution.
- Be a point of contact for my institution in regards to research study and researcher.
- Assist in the logistical aspects of providing students from my institution the opportunity to participate in the study. Including obtaining contact avenues for designated student population and subject groupings and disseminating correspondence from researcher to these designated students.
- Direct any questions, comments or concerns to the primary researcher or secondary researcher.

Statement of Non-Coercion:

In my capacity as institutional representative for this Learning Styles Research project I shall not take on the role of active recruitment of participation, nor use any relationship with prospective subjects to encourage, discourage or otherwise influence their participation. My role is to inform the designated student population and/or subject list about the availability of the research and/or provide prospective subjects with information about contacting investigators.

Name: Samuel T. Lopez
Position: Director, Multicultural Academic Services
Institution: University of North Carolina Charlotte
Signature: [Signature] Date: 03/18/10

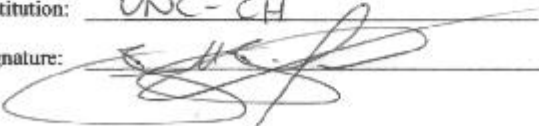
University of North Carolina-Chapel Hill

Learning Style Differentiation in Hispanic College Students in Selected Institutions in the North Carolina Public University System**Institutional Representatives Roles and Responsibilities:**

- Assist the researcher in navigating the IRB process and protocols for my institution.
- Be a point of contact for my institution in regards to research study and researcher.
- Assist in the logistical aspects of providing students from my institution the opportunity to participate in the study. Including obtaining contact avenues for designated student population and subject groupings and disseminating correspondence from researcher to these designated students.
- Direct any questions, comments or concerns to the primary researcher or secondary researcher.

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In my capacity as institutional representative for this Learning Styles Research project I shall not take on the role of active recruitment of participation, nor use any relationship with prospective subjects to encourage, discourage or otherwise influence their participation. My role is to inform the designated student population and/or subject list about the availability of the research and/or provide prospective subjects with information about contacting investigators.

Name: Josmell J. Perez
 Position: Multicultural Programs Coordinator
 Institution: UNC-CH
 Signature: 

Date: 3/10/10

University of North Carolina-Wilmington

Learning Style Differentiation in Hispanic College Students in Selected Institutions in the North Carolina Public University System**Institutional Representatives Roles and Responsibilities:**

- Assist the researcher in navigating the IRB process and protocols for my institution.
- Be a point of contact for my institution in regards to research study and researcher.
- Assist in the logistical aspects of providing students from my institution the opportunity to participate in the study. Including obtaining contact avenues for designated student population and subject groupings and disseminating correspondence from researcher to these designated students.
- Direct any questions, comments or concerns to the primary researcher or secondary researcher.

Statement of Non-Coercion:

In my capacity as institutional representative for this Learning Styles Research project I shall not take on the role of active recruitment of participation, nor use any relationship with prospective subjects to encourage, discourage or otherwise influence their participation. My role is to inform the designated student population and/or subject list about the availability of the research and/or provide prospective subjects with information about contacting investigators.

Name: Edelmira Segovia

Position: Director - Centro Hispano

Institution: UNCW

Signature: 

Date: 7-27-10

North Carolina State University

University legal counsel advised the contact for institution not to sign the agreement. However, the method for distribution for North Carolina State University was through electronic list-serve. The institutional contact played no role in distribution and did not have direct access to the students who received the invitation to participate.

Appendix E

Pre-survey E-mail

Good Day:

In a few days, you will receive an e-mail request to fill out a web questionnaire. The questionnaire is for an important research project being conducted for my dissertation. I am a doctoral student at the University of Nebraska at Lincoln however I live in Wilmington, North Carolina. As a doctoral student I must complete this research project in order to graduate.

The project is concerned with learning styles, or learning preferences, of undergraduate students and how these may be related to the student's ethnic heritage. The questionnaire itself is based on an instrument called the Index of Learning Styles, developed by Richard Felder at North Carolina State University. It is a 44 item questionnaire that asks you as a respondent to give your preferences in learning situations. The study is important because it will help the educators at your institution to better understand your needs and will assist them in providing effective learning experiences.

I recognize that participation in this project is voluntary, and I truly appreciate your participation in it. I thank you in advance for your time and consideration; your unique perspective will provide useful information for this study.

Cordially,

Robert Tripp
Student
University of Nebraska
910-599-1340
rtripp@nchousing.org

Appendix F

Accompanying E-mail

Good Day:

I am writing to request your assistance with an important research project I am conducting as part of my dissertation. I am a doctoral student at the University of Nebraska at Lincoln however I live in Wilmington, North Carolina. The purpose of the project is to explore relationships between learning preferences and ethnic heritage.

I am contacting a sample of students from select institutions in North Carolina and asking them to complete a short learning styles inventory. The questionnaire itself is based on an instrument called the Index of Learning Styles, developed by Richard Felder at North Carolina State University. There is a short section for recording demographics and the a 44 item questionnaire that asks you as a respondent to give your preferences in learning situations. Completion of the instrument should take between 10 and 15 minutes. To access the survey click the link below.

<http://www.surveymonkey.com/s/tripp-learn>

The project is concerned with learning styles, or learning preferences, of undergraduate students and how these may be related to the student's ethnic heritage. The study is important because it will help the educators at your institution to better understand your needs and will assist them in providing more effective learning experiences.

I recognize that participation in this project is voluntary, and I truly appreciate your participation in it. I thank you in advance for your time and consideration; your unique perspective will provide useful information for this study.

Cordially,

Robert Tripp
Student
University of Nebraska
910-599-1340
rtripp@nchousing.org

Appendix G

Thank you/ Reminder E-mail

Good Day:

I wanted to thank you for completing the on-line learning questionnaire I sent to you two weeks ago. The information you have provided will help the faculty and administrators at your institution to better understand your needs and will assist them in providing more effective learning experiences to you.

If you have not completed the questionnaire yet please take 10-15 minutes to go through the 44 item survey. The items simply ask your preferences in learning situations. And the information you provide will be extremely helpful. To get started, click the link below.

<http://www.surveymonkey.com/s/tripp-learn>

I recognize that participation in this project is voluntary, and I truly appreciate your participation in it. I thank you in advance for your time and consideration; your unique perspective will provide useful information for this study.

Cordially,

Robert Tripp
Student
University of Nebraska
910-599-1340
rtripp@nchousing.org

Appendix H

E-mail emphasizing the importance of Research

Good Day:

A few weeks ago you received information from me about a research project I am conducting as part of my dissertation at the University of Nebraska. IF you have already completed the instrument, thank you. If you have not, please consider clicking the link below to access the survey. The questionnaire is a 44 item questionnaire that asks you as a respondent to give your preferences in learning situations. Completion of the instrument should take between 10 and 15 minutes.

<http://www.surveymonkey.com/s/tripp-learn>

As we move into a time of unprecedented diversity in our institutions of higher learning it is vitally important that faculty and administrators understand the differences in the students attending their schools. Differences come in many forms, this project is concerned with learning styles, or learning preferences and how these may be related to the student's ethnic heritage. The study is important because it will help the educators at your institution to better understand your needs and will assist them in providing more effective learning experiences for you and your fellow students.

I recognize that participation in this project is voluntary, and I truly appreciate your participation in it. I thank you in advance for your time and consideration; your unique perspective will provide useful information for this study.

Cordially,

Robert Tripp
Student
University of Nebraska
910-599-1340
rtripp@nchousing.org

Appendix I

Final Reminder E-mail

Good Day:

In the past weeks you have received e-mails directing you to an important learning styles instrument as part of a research project I am conducting as part of my dissertation. I am a doctoral student at the University of Nebraska at Lincoln however I live in Wilmington, North Carolina. The purpose of the project is to explore relationships between learning preferences and ethnic heritage.

This research will not only provide valuable information to the faculty and administration at your school it will allow me to graduate. If you have not already done so, please take 10-15 minutes to go to the link provided and answer a few short questions about your preferences in learning situations.

<http://www.surveymonkey.com/s/tripp-learn>

Once again, I recognize that participation in this project is voluntary, and I truly appreciate your participation in it. Whether you have already taken the survey or are about to, I thank you in advance for your time and consideration; your unique perspective will provide useful information for this study and will provide me with the necessary data to complete my dissertation. Thank you.

Cordially,

Robert Tripp
Student
University of Nebraska
910-599-1340
rtripp@nchousing.org

Appendix J

Informed Consent Form

INFORMED CONSENT FORM

(To be posted on the first page of the instrument in Survey Monkey™)

IRB#20100210139 EX

Identification of Project:

Learning Style Differentiation in Hispanic College Students in Selected Institutions in the North Carolina Public University System

Purpose of the Research:

The purpose of this study is to determine if there are discernable, quantifiable differences of learning styles for undergraduate Hispanic students as compared to non-Hispanic undergraduate students. The study will quantifiably categorize learning preferences using Felder and Soloman's Index of Learning Styles, or ILS (1991). This information will be utilized to make recommendations on methodological strategies for educational activities, services and environments that address the learning needs of the Hispanic population who attend state-funded, or "public," post-secondary education in the state.

You must be 18 years of age or older to participate. You are invited to participate in this study because you are a student attending one of four selected institutions in the University of North Carolina system, North Carolina State University, University of North Carolina-Chapel Hill, University of North Carolina-Wilmington and University of North Carolina-Charlotte.

Procedures:

Participation in this study will require approximately 10 minutes of your time, and is not considered as part of any university requirement. The questionnaire to be completed is furnished on "Survey Monkey™." The questionnaire is based on an instrument called the Index of Learning Styles, developed by Richard Felder at North Carolina State University. There is a short section for recording demographics and then a 44 item questionnaire that asks you as a respondent to give your preferences in learning situations.

The project is concerned with learning styles, or learning preferences, of undergraduate students and how these may be related to the student's ethnic heritage.

Risks and/or Discomforts:

There are no known risks or discomforts associated with this research.

Benefits:

You may find the learning experience enjoyable and the information may be helpful to you as you think about how you best learn. The study is important because it will help educators to better understand the needs of students and will assist them in providing more effective learning experiences.

Alternatives:

If you do not want to take part in the study you may simply exit the Survey Monkey™ window on your computer. If you would still be interested in taking the Index of Learning Styles and not participating in this study you can go to <http://www.engr.ncsu.edu/learningstyles/ilsweb.html>.

Confidentiality:

The data will be collected through Survey Monkey™. It will be sent to a secure server and encrypted while in transit. The researcher will not be collecting IP addresses. Although each individual instrument will be scored separately, analysis will be done on the combined results with no identifying reference to the individual completing the instrument.

Any information inadvertently obtained during this study which could identify you will be kept strictly confidential. The data will be stored in a locked cabinet in the investigator's office and will only be seen by the investigator during the study and for no more than two years after the study is complete.

The information obtained in this study may be published in scientific journals or presented at scientific meetings but the data will be reported as aggregated data.

Compensation:

There will be no compensation for participating in this research.

Opportunity to Ask Questions:

You may ask any questions concerning this research and have those questions answered before agreeing to participate in or during the study. You may contact the investigator or secondary investigator at any time. Contact information for the primary investigator, Robert Tripp, is (910) 599-1340, office phone, and e-mail, rtripp@nchousing.org. The secondary investigator, Dr. Richard Hoover, may be reached at (402) 472-3058, office phone, and e-mail, rhoover2@unl.edu. If you have any questions about your rights as a research participant, or to report any concerns about the study, you may contact the University of Nebraska-Lincoln Institutional Review Board at (402) 472-6965.

Freedom to Withdraw:

Participation in this study is voluntary. You can refuse to participate or withdraw at any time without harming your relationship with the researchers, the University of North Carolina-Chapel Hill, the University of North Carolina-Charlotte, North Carolina State University, the University of North Carolina-Wilmington, or the University of Nebraska-Lincoln, or in any other way receive a penalty or loss of benefits to which you are otherwise entitled.

Consent, Right to Receive a Copy:

You are voluntarily making a decision whether or not to participate in this research study. By completing the instrument and clicking the submit button on the Survey Monkey™ questionnaire you are certifying that you have decided to participate having read and understood the information presented. You may print a copy of this consent for your records.

Name and Phone number of investigator(s)

Robert Tripp, MS, Principal Investigator

Richard Hoover, PhD, Graduate Supervisor for Primary Investigator

Office: (910) 599-1340

Office (402) 472-3058