

CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

AN EXAMINATION OF STUDENT-FACULTY INTERACTION IN STEM  
RESEARCH PROJECTS AMONG TRANSFER STUDENTS OF COLOR

A dissertation submitted in partial fulfillment of the requirements

For the degree of Doctorate of Education,

Educational Leadership

By

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## ABSTRACT

### AN EXAMINATION OF STUDENT-FACULTY INTERACTION IN STEM RESEARCH PROJECTS AMONG TRANSFER STUDENTS OF COLOR

By

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Doctorate of Education, Educational Leadership

The purpose of this study was to examine the experiences of transfer students of color participating in a STEM research program. This examination focused specifically on student-faculty interactions. One-to-one semi-structured interviews were conducted with nine students and participant observations were performed at a large regional urban public four-year university in the southwestern portion of the United States. I used Spradley's ethnographic concepts, a cultural thematic analysis, for interviews and observations to conduct the research for this study. Using Rendón's theory of validation, I found that student-faculty relations and the commitment of faculty played important roles in the academic and social experiences of transfer students of color in the engineering and computer science fields. The findings further indicate that student-faculty relationships impact and shape the experiences of students of color in career development and career aspirations.

The themes that emerged support the experiences of students of color as they participated in STEM research. Frequent communication, structured research-related workshops, a strong research culture, and connections of research to academic progress help transfer students of color face challenges as they participated in a faculty STEM research program.

## CHAPTER ONE

### INTRODUCTION

National attention to science, technology, engineering and mathematics (STEM) diversity has encouraged United States (U.S.) colleges and universities to increase focus on enhancing the participation of students of color. For the purpose of this study, students of color are defined as students who are non-white or Caucasian (Definitions.net, n.d.). "The term People of Color emerged in reaction to the terms "non-White" and "minority." The term people of color attempts to counter the condescension implied in the other two (Clark and Arboleda, 1999, p. 17).

Students of color enrolled as STEM majors at predominantly white colleges and universities are among the lowest academic performers, least persistent, and fewest that graduated (National Science Foundation, 2007). To address the underrepresentation of Latinas/os and low-income Latinos in STEM, Congress recently authorized a billion-dollar investment in STEM education at Hispanic-Serving Institutions (HSIs)-identified as institutions where 25 percent or more of their full-time undergraduate students are Hispanic. The federal funding seeks to promote STEM programs that offer two critical features: the extent to which students take part in educationally effective practices and the degree to which the institution produces activities for student learning which include student-faculty contact and respecting the diverse talents and ways of learning presented students of color Chickering and Gamson, 1987; Pascarella, 1985; Astin, 1984; and Pace, 1984, 1980).

## **Research Problem**

Recognizing the importance of the public two-year sector as a point of entry into postsecondary education for Latinos, Title V HSI-STEM funding has focused on promoting transfer from community colleges to public four-year universities. The Hispanic-Serving Institutions (HSI) Program provides grants to assist, improve, and expand opportunities for the attainment of Hispanic students. The HSI Program grants also enable HSIs to expand and enhance their academic offerings, program quality, and institutional stability. Federal assistance in the form of grants represents the only source of income for colleges to improve and expand on activities that national research has shown to be effective in increasing Hispanic student attainment. (U. S. Department of Education, 2013). An important driver is that STEM professionals, from a variety of ethnic and racial backgrounds, improve and enhance the quality of education. In turn, students of color, who are being supported through STEM discipline research, is likely to bring a variety of new professional perspectives to bear on the STEM field both in research and application (Jackson, 2003; Leggon and Malcom 1994). Generally, these STEM programs emphasize educational attainment as a function of access, information, motivation, affordability, academic preparation and support, social support and integration, and professional development. Using this as a premise, the issue of students' of color persistence becomes a worthy topic to study.

Daily, Eugene, and Prewitt (2007) reported a perceived weed-out culture of engineering which perpetuated ethnic isolation and a lack of interaction with faculty. Broader university barriers may inhibit minorities from matriculating through college and enter graduate studies. There has been a concerted effort, both by U. S. government

programs and private foundations to provide funding and support to universities that develop programs to facilitate retention of minority students. In fact, Museus and Liverman (2010) discuss the ways in which universities can increase and understand the issue of underrepresented student academic persistence. Their perspective is to seek ways to cultivate campus environments to make universities conducive to student success.

Unfortunately, many of these studies, which are based in the economics of higher education, have not investigated how the specific institutional characteristics of their research projects contribute to the retention, persistence and graduation of the minority student participating in the projects. This aspect proves to be important because the premise of the research seems to be pointing to the amount and allocation of funding, rather than specific design characteristics for underrepresented student success in these projects and programs. Furthermore, there has not been a substantial link between the faculty research projects and the effects on individual student outcomes and underrepresented student success.

One of the areas that have been identified as facilitating the success of minority students in STEM fields has been the quality of faculty-student interaction. Faculty-student interaction includes the use of email to contact with faculty, discussion of performance in class with faculty, career planning related to course materials with faculty, outside of class discussion of course concepts and materials with faculty, timely feedback on assignment performances, and collaboration with faculty outside of class (McClenney and Marti, 2006). McClenney and Marti indicated that the literature supports that students value interactions with faculty, which can lead toward improved learning experiences.

This chapter discusses the purpose of this study and poses the research questions that this study evaluated. This chapter provides overviews of the conceptual framework and proposed methodology to be employed in the investigation. Lastly, this chapter discusses the limitations and delimitations of the proposed study and the organization of the dissertation.

### **Research Purpose and Significance**

The purpose of this ethnographic case study was to examine the undergraduate research experiences of students of color. Specifically, this study explored the experiences of transfer students of color related to student-faculty interaction while participating in a federally funded STEM research program. This case study focused on the student-faculty interaction and how student-faculty interaction shapes the students' of color research experience.

Over the last four decades, research has shown that the student-faculty relationship can affect the students' sense of autonomy and purpose (Chickering, 1969). Further, Kuh and Hu (2001) found that student-faculty interaction has an impact on a student's academic performance and motivation, depending on the quality, setting and frequency. Volkwein, King, and Terenzini (1986) discussed the intellectual development of transfer students and their interaction with faculty develops knowledge and academic skills. In examining these factors, related to students of color, they have an even more profound impact. Based on this premise, this study explored the impact of these factors with students of color transferring from a community college to a 4-year university and participating in a federally funded faculty research project.

This study is significant because of the national attention being paid to the retention and persistence issues of students of color and the amount of funding allocated by the U. S. Department of Education, National Science Foundation and other major private and public foundations. However, the implications for this study related to research that has consistently shown that student-faculty interaction is important and is characterized by the quality faculty including faculty interest and concern for the student, rather than the frequency of the contact (Volkwein, et al., 1986). Indeed, research shows that the type of research related activities offered to a student are important to the student-faculty relationship and to academic success. Further, this study shines light on students of color who not only have challenges with the transfer process but who are also involved with faculty research projects.

### **Research Questions**

This study explored student-faculty interaction within research contexts of undergraduate transfer students of color in engineering and computer science fields participating in a federal funded research project at a HSI. The study seeks to answer the following research questions 1) what are the experiences of transfer students of color in a faculty research program in engineering and computer science at a regional urban four-year public university? and 2) how do student-faculty interactions shape the academic and career aspirations among transfer students of color in engineering and computer science fields at a regional urban four-year public university?

### **Overview of Conceptual Framework**

The primary conceptual framework guiding this study was Rendón's validation theory. Rendón (1994) discusses validation, shown through encouragement and

affirmation, can be the factor that determines success or failure, particularly for non-traditional students. Laura Rendón continues on to define validation as “an enabling, confirming, and supportive process initiated by in and out of class agents that fosters academic and interpersonal development.” Academic validation results when faculty and staff reach out to students in ways that help individuals “trust their innate capacity to learn and to acquire confidence in being a college student.” Rendón has utilized this theory in validating culturally diverse student populations. It is representative towards a new model of learning and student development (Rendón, 1994).

### **Overview of Methodology**

This ethnographic case study examined the experiences of transfer students of color involved in a scholarly STEM research project highlighting Engineering and Computer Science majors in a regional urban public 4-year HSI. This case study will use an ethnographic approach to understand the lived experiences of transfer students of color as they interact and work within an institution’s scholarly research program. Using the results of this ethnographic case study, the goal is to improve the conditions for the student-faculty relationship within the program’s dimension and to better understand the student-faculty dynamic in a federally funded STEM faculty research project.

The data sources for this ethnographic case study included nine undergraduate transfer students of color participating in a federally funded STEM research grant. These participants have transferred from local community colleges, applied to this STEM research project, and found to be eligible to participate in the project at a regional public 4-year university. The participant sampling focused on electrical engineering, computer engineering, computer engineering, computer science, and one student enrolled in the

manufacturing engineering systems program. Data collection included semi-structured interviews, ethnographic interviews, observations, and document reviews.

### **Limitations and Delimitations of the Study**

Limitations are associated with credibility and dependability in qualitative studies. Bloomberg and Volpe (2012, p. 125-126) discuss credibility as how one accounts for trustworthiness and accuracy of findings within the research and dependability as the consistency of the data. Using this as a definition, I built into the data collection triangulation from document reviews, participant interviews, and student-faculty observations. However, Wiersma (2000) states, that because qualitative research occurs in the natural setting, it is extremely difficult to replicate studies.

Due to the small number of participants, information, and the reliability of the self-reported information from the participants also constituted limitations to this study. However, as Bloomberg and Volpe (2012, p. 127) researchers seek to gain thick, rich descriptions as well as detailed information regarding the context of a study. An additional limitation is the concept of transferability, since qualitative research “implies an emphasis on exploration, discovery, and description” (Bloomberg and Volpe, 2008, p.8); this research will provide a rich description of how the student-faculty relationship influences the students’ success.

Delimitations clarify the boundaries of the study (Bloomberg and Volpe, 2012, p.114). They are characteristics that arise from limitations within the scope of a study (Simon and Goes, 2012). Specific choices made, within the scope of this study, may affect the delimitations. These choices included the conceptual framework and its alignment to the study’s scope and the participants chosen for examination. One of the

delimitations appeared when a participant was chosen beyond the scope of electrical engineering and computer science disciplines.

In reviewing the current and relevant research, I attempted to provide a greater understanding of student-faculty interaction, transfer students of color, and finally students of color participating in faculty research projects. Finally, I used a qualitative approach with this study due to the amount of quantitative research available of student-faculty interaction.

### **Organization of the Dissertation**

This dissertation is a study of the experiences of transfer students of color participating in a federally funded STEM faculty research project being conducted in a HSI. An overview of the construct of this study included a review of the literature, the methodology and research tradition which was used for the examination of the lived experiences of transfer students of color, the findings and results of the examination of their experiences and student-faculty interactions, and finally the implications for future research and policy relating to transfer students of color' experiences and their student-faculty interactions.

## CHAPTER 2

### LITERATURE REVIEW

STEM fields have experienced challenges in retention and graduation rates for students of color in colleges and universities throughout the United States. Only 11 percent of Latinos and 17 percent of African Americans, in the U.S. population age 25 and older, had attained at least a bachelor's degree, compared with 28 percent of whites and 44 percent of Asians (Association for the Study of Higher Education Report, 2003). In STEM fields, students of color earn college degrees at lower rates than do their non-underrepresented peers (Museus and Liverman, 2010). These statistics imply a need to coordinate efforts for successful academic programs, especially in the STEM disciplines, to assist students to navigate the variety of barriers along the pipeline to the workforce or graduate school. For example, half of all high school graduates are unprepared to succeed academically in college (American College Testing (ACT), 2004). According to the National Center for Educational Statistics (NCES, 2003) 29 percent of all first year students at four-year colleges and universities and about 41 percent of entering students at community colleges require remedial education (Parsad and Lewis, 2003). Diversifying underrepresented student participation in STEM fields is of national concern. Latino/a students drop out at the rate of 29.2 percent in contrast to only an 18.8 percent rate for non-Hispanic students (Kezar and Eckel, 2007).

Many students of color transfer from community colleges into four-year universities through established STEM research and academic programs designed to promote retention among this population. As a route to the four-year university, it is a common journey for low-income, first generation in college, and racial and ethnic

minorities (Rosenbaum, J.E., Deil-Amen, R., and Person, A.E., 2006). Multiple factors influence students' decision to leave college before transfer or even right after transfer to a four-year university or college. Obligations such as family, financial reasons and gender are all contributing factors.

STEM research programs have many implications for minority student retention, persistence, and graduation. Indeed, many programs collect data to assess student experiences while participating in these programs. The literature review relates to faculty-student interaction, participation in research related activities, peer-to-peer interaction, campus engagement, and career development in STEM disciplines. All of these factors can affect an underrepresented student's ability to persist in a STEM research program. Further, the data reveals differences in the frequency, quality, and the effects of these factors for educational practice and how to maximize the efficacy of students of color (Kim and Sax, 2009).

This chapter begins with an introduction to the literature in relation to the undergraduate transfer students of color, an assessment of the gaps in the literature, a description of the conceptual framework, and finally a discussion of how this study contributes to the examination of the experiences of undergraduate transfer students of color and their student-faculty interaction in research at four-year institutions.

## **Related Literature**

### **Student-Faculty Interaction**

Universities provide multiple resources to students in an effort to stimulate learning and discovery and to enhance student satisfaction; one of the most important resources for students is faculty (Cotton and Wilson, 2006). Beal and Noel (1979)

reported that two of the most significant positive characteristics influencing student retention are: 1) a caring attitude of faculty and staff, and 2) a high level of student involvement. In the former domain, research has shown that faculty plays an important factor not only in student satisfaction but also in student retention (Astin, 1993). In *What Matters in College?* Astin stated that one of the primary factors in retention was student involvement with faculty. This paper focused on student-faculty relationships and the impact upon the transfer students of color' experiences in a research project. Hathaway et al., (2002) discussed student-faculty interaction having a number of positive effects on college students, from inspiring a student to put forth their best efforts to giving them confidence to consider graduate school. Astin (1993) and Kuh and Hu (2001) also discussed the specific impact of student-faculty interaction on students. Their focus was on interactions with faculty-both in and out of class. The student-faculty interaction were found to have a broad range of student educational outcomes including academic achievement, educational aspirations, intellectual growth, and academic satisfaction

The majority of research has been conducted through large-scale survey studies that did not focus on the quality of the interaction as experienced by the students and even the faculty themselves (Kuh and Hu, 2001; Pascarella and Terenzini, 1991, 2005). When we examine student-faculty interactions, especially in STEM fields and STEM research programs, we tend to know more generally how this type of interaction supports students. Pascarella and Terenzini (1998, p.151-165) stated, "one of the most persistent and least assailable assumptions in higher education has been that of educational/developmental importance of informal student-faculty relationships beyond the classroom." Thompson (2001) reported on the effects of informal student-faculty

interaction on educational gains for science and mathematics students in a community college environment. Students' science and math educational gains were significantly enhanced by informal student-faculty interaction. The study also found that the higher level of student-faculty interaction the more effort students exerted in their science courses. Further, the Thompson study found that the higher the amount of time the students reported working, the less informal interaction they had with their faculty. Thompson also suggested that faculty members should be attempting to develop better relationships with students, especially when this reaction results in a better learning environment.

In the age of social media, the manner in which research faculty communicate with their students may also affect the quality and success of their relationships. One strategy mentioned in literature as a possible way to improve student-faculty interactions is increasing students' reliance on electronic media for communicating with faculty (Chickering and Ehrman. 1996; Kuh et al., 2005). This method of communication may close the "gap of time" sensitive information and improved the effect of the interactions. The general mode of communication of the underrepresented transfer student in this STEM research project is primarily through an online platform within the institution.

The method by which students communicate is important to discuss. The method and type of communication employed by students affect the quality of student-faculty interaction. Cox and Orehovec (2007) discuss a "typology" for the types of interactions between students and faculty. These researchers see the influenced interactions as fluid and contextual. They state that the fluidity can occur from a single or across multiple interactions and the context with which an interaction occurs may have a dramatic effect

and impact on the student (Cox and Orehovec, 2007). Their typology directly relates to a future look into the quality of faculty-student interactions experienced by transfer students of color.

### **Student-faculty interaction in research settings.**

Interacting with faculty, whether in the classroom, the laboratory, office hours, or other venues, is one of the key college experiences associated with student development (Kim and Sax, 2007). Kim and Sax (2007) discussed student-faculty interaction, related to research at large institutions. They found at least two potential challenges to faculty access in larger universities: 1) the large student-faculty ratio limiting opportunity to interact with faculty; and 2) attention to graduate students rather than focusing on the potentially powerful opportunity for undergraduate learning and engagement.

In examining students' of color experiences with research faculty, Pace (1980) discussed the concept of science-related courses and perceived educational gains and the connection between informal student-faculty interactions. Pace (1980) study examined this connection and the perceived quality of effort asserted in science courses and the perceived educational gains in science-mathematics-based courses for community college students. In fact, he developed a "quality of effort" concept for social and academic involvement which assumes that the effects of college on students' differential patterns of growth and development can be assessed through the efforts students expend in utilizing the resources provided by higher education institutions (Pace, 1980). The conceptual theory supports the notion that positive influences of informal student-faculty interaction do impact students' academic achievement in science and mathematics. A topic that warrants additional exploration is that of undergraduate student research participation,

especially in STEM fields. The connection between students' participation in research related activities is another factor related to persistence and program completion (Townsend and Wilson, 2006).

### **Undergraduate Student Research in STEM Fields**

National policy priorities to address the gap of students of color in STEM fields, both in enrollment and program completion, have been established by federal government agencies, such as National Institute of Health (NIH), National Science Foundation (NSF), the U.S. Department of Education (DOE), and private agencies to increase the number of students of color. For example, the NSF has expanded their plans for preparing a diverse engaged STEM workforce. Their efforts have broadened participation for transfer students of color and diverse institutions in all of their NSF-funded activities. More importantly, NSF plans to integrate more research opportunities, to minority students, with education and improve processes to recruit and select additional transfer students of color (NSF, 2012). A common strategy of these programs has been to focus on individual research. In fact, Lopatto (2003) asked STEM students and faculty to list benefits of a successful undergraduate research experience. Students and faculty agreed that successful research experience allowed students to: learn a topic area in depth; learn to work and think independently; learn to use appropriate methodology; and appreciate what research involves.

STEM research programs have implications for underrepresented student retention, persistence, and graduation. Indeed, findings reveal differences in the frequency, quality, and the effects of these factors for educational practice and how to maximize the efficacy of students of color (Kim and Sax, 2009). Faculty members are

important socializing agents for students, and through the interactions with departmental faculty, students experience a unique academic sub-environment that may distinctively influence their learning and development (p. 3-4). The literature has been relatively scant in considering in-depth research of the quality of the student-faculty interactions and the successful completion of the STEM discipline programs.

Faculty members' field or discipline and levels of commitment to the dimensions of a faculty member's responsibilities (i.e., teaching, research, and service) also play a role (Einarson and Clarkberg, 2004). Indeed, the relativity of a faculty member's involvement in research and their ability to include underrepresented undergraduates in research related activities revealed the quality of student-faculty interactions. Hurtado (2007) found some indications suggesting that working on a research project with faculty is positively associated with success among minority students in STEM. The literature reveals that there are significant challenges that transfer students of color face in light of their new experiences in research related activities with faculty.

### **Challenges of Transfer Students of Color**

Research indicates that only 22 percent successfully make the transition from a two-year college to the four-year university (McCormick and Carroll, 1997). Further research indicates that students who begin at community colleges are less likely to receive bachelor's degrees, when compared to students who begin their academic career at four-year institutions (Dougherty, 1992; Pascarella and Terenzini, 1998; Pincus and Archer, 1989; and Valez, 1985). Transfer students often come from ethnically diverse backgrounds. According to Phillippe and Patton's (1999) report to the American Association of Community Colleges, 48 percent of transfer students entering the

community college for the first time were racial and ethnic minorities. Other research indicates that 42 percent of all African American college students, 56 percent of Latino/college students, 41 percent of all Asian/Pacific Islander college students, and 54 percent of all Native American college students attend a community college (Hendley, 1997). Clearly, additional research is needed to determine the challenges students of color face in order to make the transition from a two-year to a four-year institution and participate in a faculty research program.

Transfer students often experience disruptions in academic success, challenges in financial resource availability, and obstacles in developing peer and faculty networks. Frequently, during the first or second semester at four-year institutions, students experience a decline in their grade point average, commonly referred to as *transfer shock phenomenon* (Knoell and Medsker, 1965; Cejda and Kaylor, 1997). Their perceptions of university faculty may also make the transition more difficult. Although generally faculty members make themselves available outside of the classroom, announce office hours, facilitate study groups, and offer referrals to campus support services, many transfer students held negative perceptions of university faculty because they felt they were not trying to help them understand the materials presented in class on a personal level (Townsend, 1995) Indeed, transfer students of color may experience disconnection and still face barriers to academic success because of their perceptions. Further, Townsend found that university faculty sometimes encouraged a Darwinian attitude of “survival of the fittest” toward community college students.

Transition issues present significant challenges to students of color. In fact, challenges related to academic and social integration at four-year institutions like

developing new faculty and peer networks along with adjustments to new academic expectations and becoming familiar with the academic and institutional resources available to them present as major challenges (Kerr, King, and Grites, 2004). Not only are there academic integration issues for transfer students of color but also the availability of financial resources. The cost of education has increased and fewer grant dollars and scholarships are being awarded, while federal student loan debts are increasing. With increased economic pressures, transfer students from low socioeconomic backgrounds are often forced to ask themselves whether or not a four-year degree is worth the financial debt load. Financial considerations may be especially relevant for transfer students who have already entered the workforce (Wynn, 2002).

Another challenge among transfer students is the articulation of their community college courses to a four-year institution. Nearly 50 percent of transfer students come from technical programs at community colleges (Eggleston & Laanan, 2001). Often, the transferability of technical course credit is inconsistent between two-year and four-year institutions (Keener, 1994). As the number of transfer students seeking admission into four-year institutions increases, chances are that we will also see a rise in the number of transfer students faced with articulation issues once they reach a four-year campus (Wynn, 2002).

Transfer students of color have skills and talents developed at the community college in lower division courses, unique experiences developed from these courses, invaluable research approaches from other lens, creativity and innovation, and lastly, excellence in diversity and cultural understanding (National Science Foundation, 2012). The NSF suggests that transfer students of color are facing challenges including

confidence and trust as they relate to their four-year institutions, uneasiness as they navigate their new environments, and, in many cases, the lack of opportunities and support to facilitate their success in their new environments (NSF, 2012). The creation of programs that promote a seamless transfer process and successful transition programs for students of color from community colleges into STEM fields at universities requires concerted and collaborative leadership within and across two and four-year institutions (Rivera, 2010).

### **Gaps in Current Knowledge and Practice**

Much of the current research affords understanding into the experiences and influences of underrepresented first-generation students during their college years. However, gaps still remain in the research relating to underrepresented first-generation transfer students' experiences transferring from two-year to four-year university. Additional gaps in the current knowledge and practice are studies relating to student-faculty relationships as students of color participate in STEM research related programs. More specifically, there is scant research in the experiences of the first-generation underrepresented transfer student who participates in faculty research projects and the challenges facing their academic success.

In reviewing challenges facing students of color, much of the literature points to student-faculty interaction as a factor that significantly heightens their academic success. There is still a strong need for additional research into the effects on the transitions of students of color and studies relating to the specific challenges that underrepresented first-generation students face such as financial burdens, academic supports, and family issues.

## **Conceptual Framework**

Critical theories of education have put forth the argument that educational institutions, through formal and informal policies and practices, tend to reinforce socio-economic structures of domination (Mook, 2002). Based on criteria related to situations where certain groups are treated differently in terms of attention, counseling, and situations where some students benefit from a structural position of advantage because of socio-economic class, some theorists have postulated different perspectives relating to students of color (Mook, 2002). Longerbeam, et al. (2004) discussed this issue of “survival of the fittest” in the scope of academic incongruity. This academic incongruity occurs when students are unable to fully function in an academic environment or when they have fewer faculty role models, when the curriculum is Euro-centered, and the perspectives of the students are silenced or marginalized (Longerbeam, et al, 2004). The Longerbeam, et al. (2004) suggest that academic incongruency can have a profound impact on the transfer student and with all the other challenges facing transfer students of color, this is bound to hold true for them as well. Rendón, Jalomo and Nora, (2000) stress that students of color are disconnected, face barriers and transitional problems crossing the academic border of the incongruent academic world. They make a key point that scholars who use concepts of academic and social integration as a way to study success should realize that these constructs privilege students who best fit into the mainstream academic cultures (Rendón, Jalomo and Nora, 2000).

This is the foundation that Laura Rendón’s validation theory (1999) speaks to in regards to students of color and especially those of Hispanic or Latino heritage. Rendón (2009, p.1) states, “The numbers show that Hispanic students are the least educated

among all ethnic communities in the United States.” While the current number of college graduates in the Latino and other underrepresented communities are dismal, there is help and support. Rendón (1994) defines validation as: “an enabling, confirming, and supportive process initiated by in- and out-of-class agents that fosters academic and interpersonal development. The definition expands to academic validation resulting when faculty and staff reach out to students in ways that help individuals trust their innate capacity to learn and to acquire confidence in being a college student” (Rendón, 1994, p. 33-50).

Rendón’s theory argues for changing the educator’s assumption to tell the student to “tough it out and learn how to succeed without intervention” (Rendón, 1994, p.33-50, 2002, p. 642-667). Rendón and Burgis (2006), found that students in learning communities where faculty incorporated learning through contemplative practice (e.g. journaling, time for reflection and meditative activities) in developing critical and problem-solving skills, generated both intellectual, social, and spiritual learning outcomes. The impact of learning communities or cohorts is critical for minority student success. These learning communities perpetrate the “validation” that Rendón speaks of. Faculty, who incorporate these contemplative activities in their interactions with the underrepresented student, increase the persistence of those students. Validation Theory calls for faculty and staff to get closer to students, to reach out to students, and to offer assistance to help students make social and emotional adjustments in college and their personal lives (Rendón, 1994).

Validation does not assume students can form connections on their own and asks college faculty to take initiative in reaching out to students to assist them in learning

more about college and to have a positive college experience (Rendón, 2006). Rendón continues to reflect more into the life of the underrepresented student. She posits that the underrepresented student is viewed as moving “back and forth” among the family, community, and postsecondary educational worlds, engaging with multiple structures and actors and having both positive and negative experiences along the way. The underrepresented student may not be able to transition fully into the 4-year institutional experience because of their challenges to balance life at their new college, their culture, and challenges of life, in general. According to Rendón (2006), there’s also a general lack of knowledge about college experience in families of Hispanic families and especially first-generation students, making the prospect of going to college sometimes insurmountable. Race, class, and gender—as well as the larger system of societal structures of rewards and opportunities that foster equality or inequality—may shape these interactions (Rendón).

Continuing with literature from Rendón (1999), she goes deeper to discuss, what she refers to as academics of the heart. Rendón continues to examine these concepts as having five features. One of the features that pairs up with her validation theory and student-faculty interaction is that of “relationship-centered care.” This term has been related to a holistic approach to health care; however, when we look at the student-faculty relationship it is closely aligned with the notion of faculty caring for their student’s whole being as students, researchers, mentees, and cohorts (Rendón). Another feature of her academics of the heart is Rendón’s is the issue of honoring and respecting diverse ways of knowing. Rendón continues with informing faculty to make contemplative practice and reflection for both themselves and their students as a part of the mainstream agenda of

teaching, learning, research and practice. Rendón (2002) feels the need to change the agreement in education that good teaching and learning evolve from a model that distances faculty from students and that separates teaching from learning.

Rendón, (2006, p. 1) states that there is a need to “reconceptualize success” for minority students. It requires a dismantling or revising entrenched methodological approaches and theoretical views about the underrepresented student and to view the student as a whole person who brings strengths, as well as deficits, all of which affect student success (Rendón). All of these attributes need to be validated through multiple student interactions with the different systems inherent in the institution (Rendón). One of these interactions is most certainly the student-faculty relationship and interaction.

### **Connection of Conceptual Framework to Study**

According to Rendón’s theory of validation (1994) encouragement and affirmation can determine the success or failure for minority students and can play an important role in regard to college impact. In applying this model, it will be evident that faculty concern, support and caring through their interactions with students can have a profound impact on the transfer students of color experiences in the STEM research project. Accordingly, the faculty member’s ability to interaction or not interact with students in an affirming manner, has the potential to affect the underrepresented transfer student.

Rendón (1999) suggests that by developing a model that will re-conceptualize the traditions that have worked against community, the balance of reason and spirit, and the education of the whole person in higher education, her academics of the heart will engage the hearts of others and the intellects. By examining the student-faculty relationship and

their interactions together, we can better understand the impact that these interactions have upon transfer students of color and their success in the STEM research program. Using Rendón's theory of validation (1994), as a conceptual framework, allows this study to examine all the facets related to the underrepresented transfer student research experience and its predictive value of the student-faculty interaction within a large public university.

### **Summary**

In order to improve these completion rates in the STEM fields, numerous research programs have been initiated by governmental and private agencies to foster persistence and graduation for the underrepresented student. The research value was to examine the experiences that transfer students of color have while participating in STEM research programs. Literature points us to looking into the quality and type of student-faculty interactions, as one major factor in promoting academic success in STEM research opportunities for the underrepresented transfer student. Lamport (1993) supported the research by his findings that student interaction with faculty and its impact with academic achievement. He further posits that increased interaction is also related to increased satisfaction with a student's educational institution. He further offered that faculty who serve as socializing agents, positively affect a student's academic achievement, persistence, career, and educational aspirations (Lamport, 1993). However, what is not in the literature time after time is the research that all of the student-faculty interactions impacting transfer students of color. Due to the lack of research regarding transfer students of color participating in STEM research programs, this research became important to conduct.

The quantity and quality of student-faculty interaction for undergraduate transfer students of color participating in STEM faculty research projects is noteworthy. Terenzini (1986) who reports research indicating that not only is the quantity of student-faculty contact important for retention, but the quality of such contact is also critical. As for what constitutes “quality” contact, he concludes that “those interactions involving discussion of intellectual and course-related matters appear to be among the most powerful influences.” Not only are these quality interactions critical, but also strong networking values, a belief in humanizing the educational experience, a commitment to targeted support, and an assumed institutional responsibility for racial/ethnic underrepresented student success to drive the development and maintenance of holistic support systems, consisting of an array of important programs and practices to which students of color have access on the larger university campuses (Museus and Liverman, 2010). The research in this area of faculty networking for transfer students of color and their “critical and holistic care” (p.17-27) to promote academic success, academic integration, and research engagement is profoundly absent. This is why this study is important.

This study provided a descriptive lens into the impact of student-faculty interaction for transfer students of color. My hope is that this study provides support for new educational practices and policies on how to maximize the underrepresented transfer student’s efficacy in student-faculty interactions and minimize the stigmas related to race, ethnicity, social class, and first-generational differences (Kim and Sax, 2009). Research in the area of underrepresented transfer student retention in STEM research programs requires continual focus on the factors related to the barriers to their academic and social success.

## CHAPTER 3

### METHODOLOGY

The purpose of this ethnographic case study was to examine the experiences of transfer students of color in a federally funded science, technology, engineering and mathematics (STEM) research project. Specifically, this study focuses on the student-faculty interactions within research contexts among transfer students in engineering and computer science fields. The following research questions guide this study: What are the experiences of transfer students of color in a faculty research program in engineering and computer science at a regional four-year public university? How do student-faculty interactions shape research experiences among transfer students of color in engineering and computer science fields at a regional four-year public university?

This chapter begins by describing the research site, setting, and context. The chapter then proceeds to describe the research participant purposeful sampling and all the data sources to be employed. This study included a small group of transfer students of color and research faculty. The instruments and procedures section details data collection and analysis portion of this chapter. The interview protocol, along with the standards of this study, and the Descriptive Observation Guide which was used to observe the participants in their “natural” settings, are all included in the appendix of this document. Lastly, I have included an analysis of my researcher roles and assumptions as they relate to this study. As an African-American female, my role and assumptions meaningfully shaped my analysis and had a profound impact on this research.

## Research Design and Tradition

This case study used an ethnographic research tradition. Spradley (1980, p.26) describes ethnographic research as “an explorer seeking to describe a wilderness area rather than trying to ‘find’ something.” Using an ethnographic tradition, this study focused on describing a particular aspect of a student community participating in a faculty research project. The experiences and interactions of transfer students of color with faculty mentors represent *topic-oriented* ethnography. This case study narrowed the focus to one aspect of student life within the faculty research communities: student-faculty interaction (Spradley, 1980, p. 31). Unique to each faculty mentor, I explored the experiences of transfer students of color, in this study, through interactions with faculty in a research community.

This study focused on student-faculty interaction and the system of relationships between students and faculty that formed as they participate in faculty research programs. Merriam (2009, p. 44.) discusses the use of an “in-depth description and analysis of a particular bounded system.” By examining the interactions of these students of color, this case study is bounded within a university campus and faculty research groups. I anticipated that the results would yield the rich and in-depth descriptions of the students’ experiences and perceptions as they participated in their research and faculty mentoring activities. According to Rossman and Rallis (2003, p.104), case studies are “in-depth detailed explorations of single examples (an event, process, organization, group or individual).” In this case study, I hoped to explore how the faculty-student interactions shaped the students’ research experiences. This case study examined a specific group of transfer students of color who participate in a bounded faculty research project. By using

ethnography, as the tradition, I uncovered patterns of faculty research culture as the students participate in these research groups which focus on engineering and computer science disciplines. Additionally, one student did “crossover” from the manufacturer’s engineering systems program into the electrical engineering discipline for summer research. Given the uniqueness of the disciplines, the faculty research projects tend to be different in structure and focus. For example, while the engineering group-in the field of electrical engineering focused on hands-on prescriptive projects, the computer science group explored more theoretical projects.

Exploring the experiences of the students as they participated in the faculty research groups uncovered their unique bonds and their unique behavior patterns. Schram (2006, p. 68) stated that an ethnographic tradition focuses on understanding the patterns and regularities of behaviors among groups. These student-faculty research projects included regular activities and behaviors that shaped the students’ experiences as they participated in the program. This pattern of regular activities afforded me the opportunity to describe the lived experiences of the participants. By using an ethnographic approach, I was able to describe the program’s culture and experiences of undergraduate transfer students of color, as student researchers, and as they interacted and worked within a scholarly research program. Spradley (1979) defined ethnography, as the work of describing a culture (p.3). There are specific behavioral patterns, customs, and way of life that can all be defined, including explicit expectations and behavioral patterns that shape the research program and the student-faculty interactions. The engineering research group developed research projects prescribed in concert with

industry partners that support design models. By contrast, the computer science research group focused on theoretical research based computer programming and network designs.

This study examined the behaviors and customs within the program and generates the knowledge that people use to interpret experience and produce social behaviors. As Schram (2006, p.68) states, ethnography represents both a process and a product. The process, in this case study, was the interactions between the students and faculty which resulted in descriptive lived experiences, as a product, of the student-faculty relationship. The goal of this case study was to examine these student-faculty interactions and determine how they shaped the experiences of transfer students of color participating in a research project.

Examining the experiences and interactions of students of color, this case study uncovered the interactions of people within their cultural system and explored the ways people construct their lives. By examining the experiences and interactions of the students as they interacted with faculty as student researchers, this study explored the culture and behaviors of undergraduate transfer students of color. The participation in the research-related activities, experiences, and interactions of the students with the faculty mentors was the primary focus of this important ethnographic research. First, this study supported a better understanding of faculty-student interactions in a federally-funded STEM research project. Secondly, the social behavior and the faculty-student interactions reflected patterns of expected behaviors of students in a research program. Third, the behaviors that the students exhibit reflected their bounded culture within a specific period of time (the duration of the faculty research project) with specific circumstances (project activities) from the particular perspective (the faculty research project). In this study,

exploring the behaviors of students of color, as they participated in their faculty research groups, helped to understand their culture, their behaviors, and their interactions with their research environments all of which helps us to build supportive and effective learning environments for students who historically do not persist, succeed, and complete programs.

Pascarella (1984) found that the impact of the students' interaction with socializing agents on campus can have a powerful impact on their development growth, their academic success, and their retention. This study provides a "cultural snapshot" of the behaviors of participants and their response to their environments. As Schram (2006, p.36) described, part of the orienting concepts of ethnography involve describing evidence of cultural patterns and the abstractions that are made based on the evidence. Examining the qualities and experiences of the interactions between students and faculty provided further understanding of the academic success of transfer students of color.

### **Site Selection and Research Setting**

#### **Institutional and Program Setting**

The institutional site for this study was a regional urban public university in the Southwestern portion of the U.S. The university is a Hispanic Serving Institution (HSI), which means this institution has an enrollment of undergraduate full-time equivalent students that is at least 25 percent Hispanic students. Founded in the late 1950's, the university is in the heart of an urban region. The university is among the nation's largest single-campus universities. With a large Hispanic and Latino/a student population, the student socio-demographic characteristics reflect the university's mission and character. The university maintains an alumni group inclusive of award winners, public nationally-

recognized public figures. The average age of the students is 24.4 years with the largest age group percentage being the 18-20 year olds. Hispanic and Latino/students comprise over a quarter of the student population and the students have a full-time student population over 80% (College Portrait, 2013).

The research program that was the focus of this study is a part of the university's college of engineering and computer science. The college was awarded a Title III, Part F, Hispanic-Serving Institution STEM and Articulation Program cooperatively arranged and developed with a five-year, federally-funded grant. The program components include college faculty, who are involved with active research projects; HSI-STEM partners including two local community colleges from which a majority of the students transfer from; an advisory board of industry partners; and an internal and external evaluation and assessment team. The objective of the project is to advise and track transfer students of color in engineering and computer science disciplines using faculty and peer mentoring to provide a seamless transfer from two-year to four-year institutions. The research program consists of faculty utilizing research-related activities to interact with transfer students of color.

### **Research Group Selection and Description**

I selected two faculty research groups to explore in this study. The first group is the computer science group which focused on exposing the students to computer science abstract models, models on operating systems, and models in computer theory. The computer science students worked in pairs and they researched computer models and for everyday activities where the given model could be applied. In selecting the computer science research group, I also used a network strategy. Knowing the computer science

students were closely-knit and the faculty mentor was very involved with the student-faculty research and extra-curricular activities, the selection of this group was beneficial to this study. I was able to network with the faculty mentor on a personal level which opened my access to the group and also to the research activities. Using both the purposeful and network strategies, they offered a dual approach to selecting transfer students of color who are participating in the faculty research project. Bloomberg and Volpe (2012, p. 248) define network sampling as a few participants who are selected and who also possess certain characteristics and, in turn, refer other participants who are known to have the same characteristics. The faculty mentors established a network of like-minded students to conduct research related activities.

The second research group comprised the electrical and computer engineering fields. This research group had specific research plans and designs. The primary purpose of the research activities were designed to promote undergraduate research between four-five students in a broad scope of electrical and computer engineering projects. The research projects are presented to undergraduate transfer students of color with a problem to collaborate with faculty mentors to find a solution (Bavarian, 2013). The engineering groups work on projects initiated by industry partners and the student-faculty sessions were more “hands-on.” For example, this engineering research group was working to build a renewable power system with scripted activities and project designs. This faculty mentoring group included students sharing and pairing discussions on classwork and projects. I also used network sampling strategies in selecting this engineering research group. Like snowball sampling, network sampling utilizes a “word of mouth” approach of acquiring participants. The students involved with this faculty research were also a

small group and easily identify other group members. This method allowed me to access a population not easily identifiable.

In general, sampling strategies, such as the network strategy, are considered purposeful sampling strategies where researchers select cases with a particular purpose or goal in mind. The advantage of network sampling is that these hard-to-reach populations are penetrated and recruitment is fairly convenient and inexpensive for the researcher. Most research methods experts find that network sampling is just as effective as other, more random methods and rarely leads to validity or reliability errors (Miles and Huberman, 1994). The network strategy also provided me with a vantage point and opportunity to interface with the faculty mentor and access his research group from a personal level.

The two faculty members whom I selected were actively conducting daily research activities for the project in either computer science or engineering STEM disciplines during the spring, summer, and fall of 2012 and continued their projects during the academic year of 2013-14. I selected these two faculty members because they held weekly academic workshops which gave me an opportunity to see first-hand the experiences afforded to the students. Face-to-face contact and emails initiated access to the student-faculty workshops; individual research sessions; and the research site. Additionally, my role as a research assistant in the program made access readily available.

### **Researcher Access and Permission**

During the course of this study, I serve as a research assistant with this faculty research project. This position assisted me in gaining access to this site. The principal

investigator (PI) and the research supervisor granted permission to collect the data on the grant research project. My visibility within this project and as a graduate student of color allowed me to speak with and observe the undergraduate students of color and the faculty informally and formally. Based on Bloomberg and Volpe's posits (2008), the availability to be emerged in the day-to-day activities lends the deep and meaningful access to understand the experiences of this unique culture of students.

Individuals who implement or enforce regulations or policies of programs are called "gatekeepers." They are the people in settings who control "avenues of opportunity" (Hammersley and Atkinson, 1983, p.38) and (Rossman and Rallis, 2012, p. 160). It is important in all research, to gain access to sites, participants, faculty and programs associated in your study. In this case, it was imperative that I use my network and accessibility to the principal investigator to the research program and the program evaluation team supervisor who are the gatekeepers of this research program. These two individuals granted access to the site, the program, the faculty, and the participants. Their knowledge and availability assisted me in selecting the site and sample for this case study.

## **Research Sample and Participant Selection**

### **Sampling Strategy and Sample Characteristics**

In studying student-faculty relationships, I employed a criterion sampling strategy to select participants within the two faculty research groups. Bloomberg and Volpe (2012, p.248) defined a criterion sample as one in which all participants must meet one or more criteria as predetermined by the researcher. The participants of this study were eligible for the STEM faculty research program based on their demographics including

ethnicity, socio-economic status, academic major, direct participation in the project, and direct engagement in research-related activities. Specifically, the criteria that I used to select participants in this study were by, (a) ethnicity, including African-American, Hispanic/Latino/a, Mexican-American, Asian, and Middle-Eastern heritage, (b) low-income, (c) engineering or computer science major, (d) project participation, and (e) faculty research participation either during the semester or during the summer. Students who are identified as low-income typically need substantial financial assistance to attend college. Low-income students, as defined by the U.S. Department of Education (March, 2000), are those students whose family income was below 125 percent of the federally established poverty level for their family size.

### **Research sample**

The sample size for this ethnographic case study included nine undergraduate transfer students of color participating in a federally-funded STEM research grant. Four students were from the computer science/computer engineering group, four were from the electrical engineering group, and one student from the manufacturer engineering system discipline. This additional student, from another discipline, was chosen due to her relevant summer research project in electrical engineering.

I originally selected 10-12 participants to account for absences, no-shows, participants electing not to participate in the study, and any other situations that may arise due to voluntary participation. My goal was to select over the intended sample size in order to gain a total of 8-10 students confirmed and participating in the study. These participants have transferred from local community colleges, other state universities, and private colleges. They have applied to this STEM research project, and were eligible to

participate in the project at the regional public 4-year university. The demographic characteristics of the research participants consisted of over half being Latina/o and the remaining being of Middle Eastern heritage. There were three females and six males included in this study. Their age range was 23-35 years and six were of first-generation attending a post-secondary institution. Three were of second-generation status, with their fathers being the parent who had attended a post-secondary institution. Finally, all students had participated in a summer research project except for one who had never been offered research either during the semester or in the summer.

### **Ethical Considerations**

Ethical considerations accompanied my plans, thoughts, and discussions with each aspect of this study (Glesne, 2011). Ethical issues are a part of every aspect when interacting with participants and the data they yield (Glesne (b), 2011, p.162). In respect to this study, the following careful considerations were developed to minimize the risks and harm to the participants: 1) a number was assigned to each participant for identification purposes, 2) the room used for the personal one-to-one interviews had respect to their privacy and projected a non-threatening environment, 3) the confidentiality of their spoken words, written transcripts of their words, and any information they revealed had restricted access with password protection for storage of their data, 4) employment of sensitivity, empathy, strong listening skills and a minimization of personal opinion and perceptions, or feelings was employed, and 5) their informed consent will be vetted each time a participant was involved with one-to-one contact with the researcher.

## Data Collection Instruments and Procedures

### Data Collection Instruments

I used the following data collection instruments: (a) an email invitation to participate; (b) informed consent form; (c) interview protocol; and (d) descriptive observation guide. First, I used an email as the “invitation to participate” in an education study to examine the experiences and perceptions of minority transfer students as they participated in a STEM research project. Second, I used an informed consent form to protect the participants, human subjects, as they were involved with the research study. The remaining instruments, the interview protocol, the descriptive observation guide, guided online monthly journals, observation field notes, and project related documents were all data collection guides. Bloomberg and Volpe (2012, p.108) name these instruments as data collection which aided me in gathering the required information in the most appropriate and meaningful way.

**Research invitation.** A research invitation is an email invitation to ascertain the 9 participants identified from the sampling strategies and to formally announce and invite their participation in my case study. The invitation to participate provided a brief description of the institution that sponsored the study and the purpose of the study. The invitation also outlined the eligibility and expectations of participating in the study. Issues of ethics focused on establishing safeguards that protected the rights of participants.

**Consent form.** This form protects the participants from harm and ensures confidentiality (Bloomberg and Volpe, 2012, p.111). The consent form outlined the purpose of the study; the length of time of the two proposed one-to-one personal

interviews; the potential risks, such as feelings that may arise due to the nature of the questions included in the interview protocol; the rights of participants to leave or discontinue the interview at any point in time; information regarding any potential benefits for participating in the study; and finally, the disclosure of participants' confidentiality related to the collection, storage, and longevity of the data. Included in the consent form is all the identifying information of the principal researcher, faculty advisor, and institutional research board contacts related to the study.

**Interview protocol.** Interview protocol, as defined by Spradley (1979, p. 58), is an ethnographic interview which has several *ethnographic elements*. The three important elements are *explicit purpose*, *ethnographic explanation*, and *ethnographic questions*. The interview protocol, of this study, contains the *explicit purpose* where the ethnographer and the participant meet together for the interview. The interview were semi-structured but were more formal than friendly. The *ethnographic explanations* facilitate the process of participant and interviewer. Lastly, the *ethnographic questions* of the interview protocol, provides the interviewer with descriptions, structure, and contrast of the experiences provided by the participant. The interview protocol, perhaps the most important data collection instrument, provides confidentiality, protection information, and data security.

**Descriptive observation guide.** This guide served as a standard form to gather visual and unobtrusive data for both historical and contextual dimensions to the study (Glesne, 2011, p.89). The guide also served as a standard form to record any observations gathered from faculty mentor groups, observations of participants while engaging in research related activities, and any informal activity related to faculty-student

interactions. Observation guides provide a protocol for observation standardization. Spradley (1980, p.73-84), states that dimensions of a *descriptive observation* is where the observer seeks to observe the space and environment of the classroom, the students as actors, the actions of the actors, activities and events taking place during instruction, the sequence of the activities and events taking place, objects being displayed in the classroom, the goals of the teachers, and the feelings of both the teachers and students. Using *descriptive observations*, “I want to catch everything going that goes on” (Spradley, 1980, p.128). A copy of the Descriptive Observation Guide can be found in the appendix of this document.

### **Data Collection Procedures**

**Semi-structured interviews.** Semi-structured interviews included the selected nine participants; each of whom I sent an invitational email to participate in the study. I sent an email through the institutional email address assigned to each participant. I sent potential participants invitational emails during the early portion of the 2012 summer session and also during the early portion of the 2012 spring session.

Once the group of willing participants was selected, I scheduled interview times based on mutual times of availability. An alternate interview location, on and off campus was offered. I secured a private room, on campus, for the interviews which was secured through the Dean’s office and the STEM project liaison. I audiotaped the interviews on a secure laptop and also by digital recorder. I took handwritten notes of the interviews as well. I explicitly described these media accessories verbally and all media accessories were explained in the informed consent paperwork. The informed consent included

explanations and descriptions of the media accessories and their usage and I read the explanations to all the participants at the time of the interview.

The participants signed the informed consent forms and I assigned an interview protocol packet to each participant and developed a hard copy file. I assigned a random two digit number for confidential identification purposes. A copy of the interview protocol can be found in the appendix of this document. I conducted the first set of interviews over a span of one month during the summer of 2013 and the second set of interviews during the early part of spring 2014 semester.

An independent transcription service transcribed the audiotapes and I stored them on a password secured laptop before the data analysis began. Spradley (1979, p.58) describes the ethnographic interview as a “speech event.” These “speech events” have cultural rules for every aspect of it. In analyzing my data related to the interviews I conducted, there was a standard process of handling the data obtained. The interview audio recordings and hand written notes aided me in the transcription process. I hand coded each transcript for basic themes. I then put the written transcriptions into the ATLAS.ti computer analysis platform to determine additional emerging themes.

**Descriptive participant observation.** This is the best procedure to record as much as possible whenever you look at a social situation (Spradley, 1980, p. 33). He states, a major task in the ethnographic research cycle is collecting ethnographic data. By means of participant observation ethnographers observe the activities of people, the physical characteristics of the social situation, and what it feels like to be a part of the scene.

The ethnographic observations used in this study are referred to by Spradley (1980, p. 59-60), as “*passive participation*.” The ethnographer is present at the scene of action, but does not participate or interact with other people to any great extent. My role was to observe and to record, as appropriate, any notes that are relevant to the students’ interactions with faculty. I had no active participation in the observation process. I viewed the faculty mentoring sessions, some research activities, and STEM classroom lectures and activities. Observing faculty mentoring sessions aided me in describing the relationship and interactions of the student and faculty. It was an opportunity to obtain a “bird’s-eye view” of the discussion, the exchange, and interactions that occurred when a faculty mentors a student in research related activities; consults with classroom activities and provides; and career development. Using a “grand tour” descriptive process, I recorded events, highlighted quotes, and listed the activities and situations observed. Spradley (1980, p. 77-79) describes a grand tour observation as an observation occurring when the ethnographer knows very little about the situation or experience being observed, giving the research the benefit of asking some pre-questions to further detail and describe the “grand tour.”

**Focused participant observations.** These observations allow the ethnographer to triangulate their analysis of the data and provide more intricate patterns of experiences and relationships. These observations aid in developing ethnographic questions to further analyze my data. Spradley (1980, p.107), refers to these ethnographic questions as *structural*, in which it makes use of the semantic relationship of a domain within a covered term. The domains are captured through the coding process. Structured questions are repeatable and can be used in various settings of the focused observation process.

**Document review.** As described in Glesne (2011, p.85-89) document review describes documents as “artifacts” that can tell stories and that an insider can “read” to understand the culture of the people the researcher is studying. Within the STEM research project there are specific documents related to the federal grant acquired to administrate the project. These documents are a benefit to the researcher to review for program clarification, introduction, and detail description of the project constructs. Further, the participating students submitted various documents to the college and the researcher can profit from a closer and more intimate view of the participant’s experiences and feelings of their participation in the STEM research project. I gained access to these documents through my researcher’s assistant role and my relationship to the STEM research project.

These documents and artifacts provided historical and contextual dimensions to the ethnographer’s observations and interviews (Glesne, 2011, p.85-89). After reviewing these documents and handwritten notes, based on a prior vetted document review guide, they were transcribed for data analysis. I compared and contrasted the notes against the interviews and the physical session observations. Copies of the interview protocol, email invitation to participate in research, and the descriptive observation guide are included in the appendix of this document.

### **Data Analysis Procedures**

Inherent in this research project are specific language references to disciplines, events and activities germane to the participants. These references would be inherent to the culture of the program. Reviewing the data is the first task to determine the emerging themes and semantic relationships. Data analysis is an on-going process using

management, organization, and making sense of all the separate pieces of accumulated information (Bloomberg and Volpe, 2012, p. 134-138). In qualitative research, the amount of data that qualitative researchers accumulate can be daunting. Glesne (2011, p.184-217) refers to this amount of data as “fat data.” Dealing with “fat data” requires methodical organization. At some point, the qualitative researcher has to stop collecting data and move into organizing and analyzing the collected materials.

Analysis of any kind involves a way of thinking. It is a search for patterns, relationships among parts, and the relationship to the whole (Spradley, 1979, p.92). Ethnographic researchers must keep in mind that research proceeds on two levels at the same time. One level is the small examples of the culture being examined and the other level is the broader features of the cultural landscape (Spradley, 1980, p. 85-87). My case study reflects the discovery of themes within the culture of the STEM research program. In examining themes, an ethnographer identifies “social relationships” by creating simple listings of all domains necessary (Spradley, 1980, p.85-87).

In thinking about a timeline for the study, data collection began in April, 2013. The selected participants were settled into their spring class loads and some were participating in research projects, yielding rich data for classroom and research activity observations. The first round of interviews were conducted in summer, 2013 through early fall, 2013, and included faculty-student research activities of the summer. Throughout fall, 2013, data collection continues with any missed selected participants and the emphasis on data analysis and interpretation of the findings. The emphasis of the findings will bring to light the voices of the transfer students of color and to understand their experiences in the STEM project.

This case study included the experiences of transfer students of color with faculty and how these interactions shape their research experiences. Using this as a basic foundation, the preliminary segmenting and applying descriptive terms to quotes are based on concepts that appeared or emerged from the literature review conducted (Bloomberg & Volpe, 2012, p.31). In reviewing the literature, it became apparent that some basic conceptual experiences included faculty-student interactions (quality, type, and frequency); research activities conducted with the faculty (quality, type, and frequency); and career development in the area of STEM research (quality and type.)

### **Thematic Data Analysis**

The relationship between the research faculty and the students had specific themes which emerged from the ethnographic interviews. The ethnographic interview is used as an interviewing process where ideas emerge that can be better understood under the control of a thematic analysis. Thematic analysis refers to themes reoccurring throughout different parts of a culture (Spradley, 1979, p.87). Thematic analysis focuses on identifiable themes and patterns of living and/or behavior (Aronson, 1994).

In examining the process of thematic analysis, the first step was to collect the data. I collected the audiotapes to study the talk of the ethnographic interview (Spradley, 1979, p. 73-76). From the transcribed conversations, patterns of experiences are listed and came from direct quotes or paraphrasing common ideas. The next step to a thematic analysis was to combine and catalogue related patterns into any related sub-themes. Themes are defined as units derived from patterns such as "conversation topics, vocabulary, recurring activities, meanings, feelings, or folk sayings and proverbs" (Taylor & Bogdan, 1984, p.131). Themes are identified by "bringing together

components or fragments of ideas or experiences, which often are meaningless when viewed alone" (Leininger, 1985, p. 60). Themes that emerged from the informants' stories were pieced together to form a comprehensive picture of their collective experiences. When gathering sub-themes to obtain a comprehensive view of the information, it was easy to see a patterns emerging. In this case study, themes occurred throughout the nine interviews. After the transcription was completed and a hard copy had been produced I placed the copy in the above-mentioned participant file. I then began the coding of the transcribed interviews. I first performed some hand coding from the transcripts. This aided me in examining the basic word themes and patterns. Using the coding from the transcription, an analysis of the emerging themes and key concepts were sought. This process was aided through the utilization of ATLAS.ti. ATLAS.ti is a Windows-based software application that integrates a set of tools to support large amounts of data analysis across textual, graphical, audio, and video files (Durdella, 2012). I ran the transcribed file through the ATLAS.ti platform. This computer platform developed codes that allowed me to expand, eliminate and organize my handwritten codes into networks to produce a thematic analysis of the interviews. I handled each interview through this process, yielding a thematic analysis of all the emerging themes.

### **Researcher Roles**

Approaching research as a learner fosters both reflection and curiosity, which encourages a researcher to address personal and professional biases (Glesne, 2011, p. 59-60). As a researcher, I had several roles in this study. First, I am a research assistant in the research project. Second, I am a female graduate student of color female, and lastly a former undergraduate student of color who participated in faculty research. These past

experiences had a profound effect on my approach to researching the experiences of the participants. I had to acknowledge and account for any biases and clearly define each role that I played during the research. If I did not account for these roles, they would have, ultimately affected the credibility, dependability, and conformability of my study. Since I was the primary researcher of the study, including setting all parameters of the study, I had to consider the fact that I was also the learner of the study.

### **Potential biases**

My personal biases had the potential to affect my data collection and analysis. As a seasoned educator and budding researcher, I have formed opinions regarding diversity in programs that relate to retention and graduation of students of color. I have always been an advocate to students who are constantly overlooked, underserved, and underrepresented in educational opportunities. I am always looking for that program, those projects, that opportunity to lift up those students to better their worlds. As a result, I am inclined to value the focus of the faculty-student relationship as a mentoring opportunity to promote the success of the students. Clearly, the ultimate outcome of the project; however, was to examine student-faculty relationships as students of color participated in research but I needed to remain objective. As a researcher, I had to look through a different lens to yield the most trustworthy results. I had to ensure, through my study design, interview protocol, and observations that I remained steady with a clear researcher's lens, and to not let those personal biases of advocating diversity influence my analysis of the data and results.

A second bias for which I guarded for is my advocacy for diversity. A rainbow of diversity, in my definition, is a balanced array of all ethnicities which are traditionally

underserved and underrepresented in STEM research projects and socio-economic classes that have, traditionally, been excluded from the STEM pipelines. For me, this would include females, African Americans, Native Americans, and Pacific Islanders. However, in this particular project, the “rainbow” of diversity does reflect a balance of the aforementioned ethnicities. Since the site is identified as a HSI, there was a balanced amount of Hispanic/Latino (a) students. My advocacy for the missing ethnicities cannot be reflected in my past experiences with this demographic. It was important for me to acknowledge both of these biases early and mitigate any possible effects they may have had on the research.

### **Reflexivity**

While collecting, analyzing, and interpreting data, I had to remain reflective and open to all the rich data I received from the participants. Reflexivity is an interactive and cyclical process. A researcher is required to remain open with the information that is shared during any interactions with the research participants (Rossman & Rallis, 2003, p.46-48). This is one of the many strategies I had to employ to make sure that my personal advocacy of diversity and the underserved remain as a “discovery” of information for data findings. Seidman (2006) speaks to several methods to assist in this mitigation of biases, including asking open-ended questions to yield a reconstruction of experiences and avoid asking any leading questions of the research participants. This also included limiting an interjection of my own experiences (Seidman, 2006). One of the ways I mitigated this, was to not digress from the interview protocol, and to not “lead” the participant with any answers they provided.

The informant-ethnographer relationship is frequently confused with other relationships (Spradley, 1979, p.26). As the researcher, I stay focused and collected data that was representative of the experiences presented by my participants. I could not afford to confuse these relationships. Further, I utilized triangulation as a mitigating strategy to minimize my biases. By interviewing students who interacted with different faculty throughout the various disciplines in engineering and computer science, I obtained a variety of faculty-student interactions yielding descriptive dialogue.

## CHAPTER FOUR

### RESULTS

To understand how student-faculty interaction shapes the experiences of transfer students of color participating in a STEM faculty research project, I used an ethnographic case study design for this qualitative study. Data collected at an urban public four-year university revealed several themes that are relevant to the experiences of students of color participating in undergraduate research. Additionally, results revealed how student-faculty interactions shape the academic and career aspirations among transfer students of color in engineering and computer science fields. During one-to-one semi-structured interviews participants spoke of their experiences in and out of the classroom with their faculty and students. The semi-structured interviews revealed frequency of student-faculty interactions, the type and quality of student contact with faculty, the effects that interactions had on students' academics and scholarly experiences. Additionally, ethnographic interviews revealed further descriptions, structure, and contrasts of the participants' contact with faculty. Descriptive field notes resulted in data related to patterns of research activities and other informal activities performed by the participants. Finally, analysis from the document reviews opened a window into how students perceived their research activity participation in relation to personal and academic growth. For interviews and observations, I used a single analytical procedure, thematic analysis that Spradley (1979, p.94) discusses. As a culminating analytic step, thematic analysis resulted in themes emerging from a series of segmenting, coding, and clustering data.

As a part of the analytical process, I transcribed the interviews and observations. I also transcribed the digital audio files along with the notes from the field observation journals, after which, I prepared to start data analysis. To begin analyzing data, I gathered all handwritten notes transcriptions, interview transcriptions, and field observation transcriptions. I initiated the analytical process with the development of codes by uploading transcripts to the ATLAS.ti platform to segment, attach codes, and cluster code families.

This chapter begins with a description of my field entry and exit experience. I then proceed into a description of each emerging theme as they relate to the conceptual framework of validation posited by Rendón and also the alignment of these themes to the related literature of Chapter 2. Additionally, this chapter also reflects the emerging cultural themes as they were revealed from interviews both with students and faculty involved with research activities.

### **Field Entry and Exit**

I initially approached the regional urban four-year university as a research assistant in the program. I had multiple conversations with the evaluator for the program. He granted me permission, along with the principal investigator for the project, to conduct my research. Upon explaining the research framework, research questions, and the manner in which I desired to proceed, I met with the program liaison. Our conversations included my methodology and the process of inviting the students to participate in the study. Subsequently, I scheduled interviews with the transfer students of color and accessed documents from the program for review. I asked the program liaison for the participants' emails so that I could invite students to participate in research. Due

to the anticipated absences and declines to participate, I over-selected the number of participants. I invited a total of 15 students, so that I would attain a possible 10 students. I sent the email invitations and nine students replied to the e-mail with their names, contact phone numbers, and availability of times for interview. I contacted each student who replied via e-mail and sent a follow-up e-mail to remind them of their interview time. All nine students responded positively and were willing to participate in the study.

My student sample consisted of nine students of color. These participants transferred from local community colleges, other state universities, and private colleges. The sampling strategy guided the selection of participants by ethnicity, gender, major, and their involvement with faculty research. The demographics of the final nine students who participated were three females, six males, four Hispanic/Latino/as, three Middle-Eastern, one African-American, and one Peruvian/Ecuadorian. The age of the sample ranged from 23 and 35 years, and most participants identified as first-generation college students. With one exception, students had participated in either a summer research project or an on-going academic year research project. Their respective majors were four computer science and technology students and four electrical engineering students. Additionally, one student's major was manufacturing systems engineering.

The students participated in at least one interview and in at least one observation session. Additionally, I chose several students for more in-depth one-on-one ethnographic interviews. I conducted all interviews and observations at the university in a designated and reserved private room for confidentiality and quiet taping of each session. However, after scheduling the interviews, several situations did arise. There were two students who repeatedly re-scheduled but eventually the interviews did take place. One student had an

emergency the day of the interview, which caused me to re-schedule his interview. Additionally, I had scheduled interviews for approximately an hour in duration for each but some interviews were more than an hour. During the observation sessions, I was a non-participating observer which gave me full access visually to the workshop activities and interactions. The observations were easily accessible, since the workshops meet on a weekly basis at a designated time. I negotiated the observations through emails and informal conversations with the faculty mentor who were amenable to my participation in their weekly sessions. The weekly workshops met on Fridays. I was able to schedule observations on Friday mornings for one faculty mentor and the afternoon for additional faculty mentors.

The workshops for the computer science majors took place in a classroom computer laboratory. I entered each workshop with the students and took a seat to the side of the small groups in the computer science group. This enabled me to observe each group and to obtain a view of the interactions between the small groups and the faculty mentor. I was introduced to the groups by the faculty mentor; however, most students knew me due to our recent one-to-one interviews and informal conversations. I remained as an observer until the workshop ended and exited the computer classroom with the students. Each student had use of a desktop computer. However, each participant brought their iPads and completed much of their work with this media device.

I had the informal conversations with the electrical engineering faculty mentors to ask permission to observe their workshops. Permission was granted and I attended their workshops on Friday afternoons. The electrical engineering group held their sessions in a classroom with tables which were moved into a U-shape in order to facilitate a seminar-

like setting and so each student could see and hear each other, along with the faculty mentor being included in the group configuration. During my observations in the classroom setting I sat outside the U-shape to observe the entire group. The faculty mentors introduced me prior to starting the group session. Again, a majority of students knew me from informal conversations with them or from the interviews. This engineering group also proceeded to a computer lab in the engineering wing. This computer lab had computers with software in which the students worked on a specific lab program. I also participated in observing the lab exercise, however, on one occasion, the faculty mentor asked me to participate in the lab. I was an active participant but was also able to view how the faculty mentor interacted with the students as he participated in the exercise as well. The lab exercise ended within an hour and I exited with the students. On one occasion I met with several students for informal conversations and ethnographic interviews privately.

At the completion of the observations, I thanked faculty mentors and students in the workshop for allowing me to visit and to observe their research projects. I transcribed my handwritten notes and also the notes from the descriptive observation guide. Then, I placed these notes in my field journal folder to organize and prepare them for data analysis.

I interviewed nine students one-on-one and each had unique descriptions of their participation in the program. The descriptions of each interviewee will be provided through a pseudonym to protect their identity.

## **John**

John is an African-American male who is a first-generation transfer student. I had difficulty in scheduling his interview. It was imperative that he was interviewed for this study as he was the only African-American male participating in the program. His perspective was crucial to understanding the lived experience of a minority male.

John's interview revealed his frustration with the program, his difficulty with relating to his faculty mentor, and also his academic progress. He did not participate in any faculty research projects, although he expressed a desire to do but was never invited. He expressed a true desire to become an electrical engineer but expressed that his academic work proved to be difficult and he received little support. When pressed about his relationship with his faculty mentor, he stated: that it was difficult to catch up with him and when you did it was hard to keep up in the meeting. The interview was enlighten and added a different perspective to the lived experiences of the students. His interview progressed for approximately one hour.

## **Jesus**

Jesus is a first-generation Hispanic male majoring in the computer science program. He is an active participant in the computer science research projects. There was no problem in scheduling his interview and he was prompt in following through with his email confirmations of the interview time and location. His experiences yielded a unique perspective of students of color. He was able to give detailed description of his participation in the research project and how he interacted with his faculty mentor. His comments included perspectives on the small groups and the weekly workshops, and the project that the small groups were producing.

The interview was lengthy and rich with descriptive data. This was a student that I asked to schedule an ethnographic interview to yield additional descriptive data of his experiences. We ended our interview with tentatively scheduling an informal conversation after his next weekly workshop.

### **Linda**

Linda was one of the four females interviewed. Linda is a first-generation Middle-Eastern female who is majoring in manufacturing systems. She had been selected for interview due to her intensive summer research project with one of the electrical engineering faculty mentors. Her experiences in the summer research were crucial to the data collection of this study.

Linda's interview was difficult to schedule due to her summer research. Her interview proved to be rich in data; however, her answers were very to-the-point giving an honest rendition of her experiences, her research project, and her relationships between her major department and her faculty mentor. Linda's interview was important to conduct due to her cross-over of STEM fields. We ended this interview by scheduling an ethnographic interview and some informal conversations so that I could learn more about her perspectives of the program as a female.

### **Sam**

Sam is first-generation Hispanic male majoring in computer science. His interview was easy to schedule, he was prompt and responded with clear and concise experiences of his participation in the program. One interesting note, Sam started a Computer Science club and this added to his experiences in the program. He is extremely active in the research projects, the club, and helps to structure the weekly workshops in

conjunction with the faculty mentor. His interactions and relationship with the faculty mentor was clearly described in the interview. We ended by scheduling an ethnographic interview to gather more in depth understanding of the research project.

### **Eric**

Eric is a second-generation male majoring in electrical engineering. He is of Peruvian/Ecuadorian heritage. He was the eldest of the participants that I interviewed. His interview was easy to schedule and Eric was also prompt to the session.

Eric was very expressive regarding his research and his participation in the program. His interview yielded rich and descriptive data along with specific experiences of his research projects. Eric's interview was very lengthy, perhaps, the longest in duration. He gave thoughts on every detail of the interview protocol. At times, I would have to bring him back on point and re-direct him back to the questions posed. Eric was the most descriptive interview and his answers drew me into speaking to him about an ethnographic interview. I also let Eric know I would be observing him in his research-related activities and weekly workshops. He was excited to detail to me what I would be seeing and welcomed observations. We ended with scheduling times for his research project observations.

### **Paco**

Paco is a Hispanic first-generation male. He is the second oldest interviewee who is majoring in computer information technology. He has a different perspective on the program due to his experience in the military and being older than most of the other students of color participating in the research projects.

Paco's interview was a bit harder to schedule as he is employed full-time and also participates actively in the research project which takes him campus at times. However, once in the interview session, his perspective on the program drew answers that piqued my curiosity. He spoke of his struggles with academics; his relationship with his faculty mentor who he felt was extremely supported and listened to his needs. He enjoyed the research project especially the ability to work in small groups with faculty mentor support. His interview was a little over an hour, but his information was descriptive. He invited me to see his research within the small group and told me of the groups scheduled activities before I could even ask. We ended the interview discussing a time to have some informal conversations and confirming by attendance at the next weekly workshop.

### **Mary**

Mary is a second-generation Middle-Eastern female. She was the eldest female interviewed. Her major is computer science. Mary's interview was difficult to schedule due to her work schedule. The interview was cancelled and re-scheduled several times.

After the many cancellations, we were able to confirm and the interview took place. Mary's interview data was from a female perspective. She expressed that she was the only female in classes many times and how that impacted her ability to work in small groups. However, she was participating in the computer science research projects but her time was nearing the end as she would be graduating soon. This information led to a more in-depth look at the program from her transfer to her graduation. We discussed her persistence in the program, her relationship with her faculty mentor, which she felt was supportive and helped her to decide some career choices upon graduation. Her interview

ended by talking about scheduling informal conversations when she was on campus again in the near future.

### **Holly**

Holly is a second-generation Middle-Eastern female who's major is computer engineering. Holly's interview was not hard to schedule. She responded promptly to the email invitation and confirmed her scheduled time. She was descriptive in her interview. As Mary, Holly described what it was like being the lone female in most of her classes. She described her summer research-related projects and her support from the faculty mentors.

Holly was informative and descriptive in her interactions with faculty, especially in regards to her academic supports and her transfer challenges. We ended her interview by scheduling a time for an ethnographic interview and also observing her research projects. I wanted ensure I would see her at the weekly workshops and she stated she never missed one. Her interview was average in length, but rich in support data of student-faculty relationships.

### **Alfredo**

Alfredo is a Hispanic male who is majoring electrical engineering. He is also a first-generation student of color. Alfredo is an older cohort member and is focused on research and future internships. His interview was difficult to schedule due to his busy research and internship schedule. His interview was shorter in duration but he provided rich data in regards to his career aspirations and how his faculty mentor has assisted him in obtaining outside internships and networking.

Alfredo felt that program helped him gain experiences in his STEM field and that his relationship with his mentor helped him academically and in choosing a career path. The interview went well but I had to probe him for deeper answers. Alfredo appeared rush because of his research schedule which resulted in a shorter interview, but average in length compared to others. We ended his interview not scheduling any ethnographic interviews or informal conversations. However, I did let him know I would be observing his weekly workshop.

As all interviews ended, I reminded students that their participation in this study was voluntary and confidential and that they have the right to withdraw their consent to participate at any time. Additionally, I asked participants if they had comments to add to what had already been asked through the interview protocol. At that time, I told participants that I may reach out to them for shorter and more informal interviews. I also shared with participants that I would be visiting their weekly workshops. Finally, I thanked students for their participation in the interviews. I then transcribed each audio file and placed this file in the participant's hard copy file along with my handwritten notes from each interview.

### **Cultural Themes**

In thematic analysis, the ethnographic researcher finds themes that recur throughout different parts of a culture and connect to different aspects of the culture (Spradley, 1979, p. 188). These themes, in this study, reflected the culture of the program and the student-faculty interaction within the program. The culture of the program refers to the acquired knowledge of experiences gained in the social and academic contexts of the research program.

The culture of the program was also reflected through the language and the words described by the participant sample during their interviews. Through my hand codes developed from the transcripts, I gathered reoccurring descriptive words from each interview. These reoccurring words helped me to analyze the participants' language once the transcripts went through the ATLAS.ti. platform. A table of these descriptive words as they relate to the emergent themes is included in the appendix of this document. Cultural themes were derived from the experiences, interactions, relationships, and the participants' spoken words between the students and their faculty mentors as they interacted with the program contexts, their cohort, the university at-large, research projects, and outside internships.

As students reflected upon their experiences aspects of the program culture became apparent. The students discussed their experiences with transfer, academic expectations in a four-year university, research opportunities afforded to them both during the school year and also in the summer, their relationships with their faculty mentors, and their interactions with their faculty mentors which assisted them in designing personal career goals. During data analysis, six over-arching themes emerged.

The cultural themes that emerged were a) frequent communication promotes student-faculty contact, b) the structure of student-faculty relationships and research workshops facilitate faculty contact with student, c) meaningful faculty commitment and caring for students, d) the effects of a research culture on the student-faculty relationships, e) interaction between students and faculty enhances academic progress, and f) student-faculty relationships helped students of color face challenges with transition.

## **Frequent Communication Promotes Student-Faculty Contact**

Communication emerged as important to the relationship and interaction between the students and faculty. The methods that faculty employed were equally as important. Communicating with faculty face-to-face in their office was a general theme and seemed to be one of the preferred ways to communicate. Other methods of communication included emails, contact at weekly workshops, and contact at supplemental labs. Most students stated that their preferred method of communicating with faculty was by face-to-face contact. Jesus explained his communication with his faculty mentor by stating, “I like meeting with [faculty mentor] because I learn a lot and get my questions answered.” Additionally, Paco stated, “When I meet with my faculty mentor I feel like I learn more. I email first to set a time and then I go when [faculty mentor] tells me to.” A female student, Linda, reported “My faculty mentor helps me with academic stuff but also possible research projects. That’s how I learned about a conference.” Lastly, another female student, Mary, stated “I was having issues with time management and my job and classes and when I met with [faculty mentor] they helped me arrange my schedule so I had time for everything.”

Students felt that face-to-face meetings provided the most favorable method of communicating with faculty. The interaction was an exchange of information focused on academics, career connections and networking, and personal issues. Sam indicated, “I go to see my faculty mentor to just sit and talk, he gives me ideas and helps me to decide what I would like to do.” Yet, Eric remarked, “I go to office hours – sometimes. I usually like to hang with them in person. Especially the ones [faculty] I really like.” Here, we see evidence that students enjoyed interacting with faculty for many reasons, but their

interaction helped the students feel more at ease and was a guiding factor in their student efficacy and persistence. Additionally, Holly also stated, “Each year I have been in the program, I have met with my faculty mentor at least once a week besides the weekly workshops.” Additionally, Mary reported that, “I see my faculty mentor once a week in the workshop, once a week in the lab, and sometimes I see him twice a week if I have a problem.” Jesus shared a more in-depth perspective:

Yeah, I talk to her [faculty mentor] a lot because she’s my advisor for the grant.

Sometimes I go to her office just for advisement for my major and sometimes we talk about classes that don’t count for my math major and my computer science major. Other times I just ask her what she’s interested in, in her field. Sometimes we just have conversations like that. She sort of gives me references to look at.

Here, this student described how faculty mentors were helpful but also friendly and personable. The face-to-face communication was preferable to meeting the students’ needs. However, there was one student who reported a challenge in communicating with faculty and implied a barrier to his academic success. John’s comment was,

Well, I’m dyslexic, so sometimes it’s like hard for me. I was talking to one of my professors last semester and he wasn’t too sympathetic to my needs. All he said to me was get it taken care of and report your problems to the special services office.

While most students reported beneficial contact with their faculty mentor, one student disagreed. This student appears to have personal issues that, perhaps, the faculty may not be able to guide the student to the appropriate campus office, and the perception of the student was challenging to their relationship. It was evident that this student was in need of a specific intervention.

Unfortunately not all students experienced positive results in communicating with faculty. For example, Alfredo stated “I have tried to talk to [faculty mentor] but I work and [faculty mentor’s] office hours does not match my hours when I am on campus. So I just guess what I need to do. I talk to other students and figure it out on my own.” Here, it appears that the issue may not be the quality of the communication but rather the quantity and the process by which the student-faculty relationship evolves.

The communication between student and faculty was a logistical procedure that helped the student feel at ease, indicated guidance and direction with research and career development, and even navigating personal issues. Paco did remark, “I met with my faculty mentor a couple times this week, she helped find a tutor. I needed one very badly.” Linda remarked, “My faculty mentor helped me a lot with my classes and figuring out what I wanted to do with my life.” Additionally, Eric stated, “[Faculty mentor] advised me about my summer research and how I can use the research to help in my future jobs.” Further, Paco stated, “I went to my faculty mentor to get ideas on what I could do for a project for class and for the summer. We ended up talking about internships I could apply for.” It is clear that faculty contact and communication impacts a student’s ability to seek out resources and the mentor’s intervention can assist the student in a positive manner.

The face-to-face meetings and interaction between the student and faculty proved to be critical to student self-esteem, academic success, and reinforced the relationship between the student and the faculty mentor. Mary stated, “Well like I said when I go to her one on one it’s to ask her my questions about my classes and what to take and all. She answers them...” This student sought out answers to academic related questions and the

experience of seeking out the faculty proved to be positive. Yet another student, John, responded to the challenge of face-to-face communication, by stating “There’s no preparing for [faculty mentor]. Catching up with him is the key. Once you get to him then it’s best to talk fast as he will shoot stuff at ya. So it’s best to just keep up.”

Clearly, this student’s experience with face-to-face communication with the faculty mentor differed greatly. This student’s face-to-face communication was less than favorable. This student experienced negative interactions with the faculty mentor. Their description of the relationships reflects a lack of “caring” and the student describes frustration with the relationship.

Beyond the face-to-face interaction, students reported a second method of communication with their faculty mentors: emails. On this point, Sam responded by saying, “I would email her about what I was supposed to do.” Yet another student, Eric, reported, “I do see him [faculty mentor] a lot, sometimes he is serious with me, and sometimes he’s friendly.” Eric continued, “He knows what’s going on outside. He knows the internships happening and he always emails me. That changed my view of the outside world.” Here, this student reported that email is important to relationships with faculty and to learn of internships and outside opportunities.

Similarly, students reported receiving program announcements and also flyers regarding industry partner events. Emails lead to face-to-face contact resulting in office hour visits and appointments with the faculty mentor. Students’ comments are clear that their communication with faculty mentors begin with emails leading to face-to-face contacts and these methods of communication are important to the student-faculty relationship. Linda reported, “My faculty mentor always announces and sends emails of

special stuff going on in the [program]. I like hearing about this stuff ‘cause it’s always good.” Additionally, Paco stated, “[Faculty mentor] always emails me right back and I can set an appointment up. That’s important around class scheduling time. Ya need their approval and advice to go forward in the program.” These comments support the student-faculty relationship is correlated with the communication processes of emails and face-to-face contacts to support the student in the research program.

Not all the students reported favorable contacts with their faculty mentor. Alfredo remarked, “My faculty mentor is hard to catch up with and probably haven’t seen [faculty mentor] all semester.” Eric also stated, “I pretty much do my own thing. I only go to see them to schedule classes and get my advising signed off.” Clearly these two students did not have strong communication or contacts with their faculty mentor. However, the majority of students interviewed supported that the relationship between faculty mentor and student revealed a commitment to communication and caring for the students’ success in the program.

### **The Structure of Student-Faculty Relationships and Research Workshops Facilitate Faculty Contact with Students**

Another theme that emerged was the importance of the student-faculty relationships and students’ selected participation in research activities. The relationships between student and faculty provide a vehicle for student-faculty contact and communication as the students participated in research related activities. This theme relates to the manner in which the faculty structures the students’ participation in research activities, such as conference participation, hands-on research, internships with industry and community partners, weekly workshop projects, and industry competitions. The

structure of the student-faculty relationship, in regards to these research related activities, facilitates the contact and communication between the faculty mentors and students.

In examining the relationship between the student and faculty as they interacted with research activities, the weekly workshops were an important focus. These weekly workshops portrayed two different scenarios of interaction. One faculty mentor engaged the students in an action research project and the interaction observed was that of group mentoring, one-to-one student-faculty mentoring and guidance, and group interaction to relay program information and announcements of the research project status.

With a different focus for each workshop, the electrical and computer engineering weekly workshop was less research oriented and consisted of group discussion, faculty mentoring and counseling, and inconsistent lab activities during the workshops. Here, John reported that, “Not really sure how I feel about the way our weekly workshops are run. I get tired of hearing students complain.” Additionally, Alfredo remarked, “I wish we had more research activities in our weekly sessions. That would be great.” However, Sam reported a more positive experience of the weekly workshops. He stated,

I’m usually the first in the classroom and I set up the power point or the website we are trying to create and then everybody starts to come. We kinda sit in our groups and talk before the actual meeting starts and before [faculty mentor] comes. When she gets here we hear the announcements she has and then each group says what they have been working on. We do the agenda that’s on the board. [Faculty mentor] does walk around and helps us out with any problems with the project.

Here, students appear to be satisfied with their faculty interactions when they have active research projects going on and their involvement is more hands-on.

It appears that the context of the program research and the weekly workshops help to infuse and enhance relationships and interactions between students and faculty. Additionally, Paco stated, “Since I have worked on this project I have met a lot of different people and learned a lot of new stuff that helped me in classes. The work on this project was great and [faculty mentor] helped me to connect to the outside world.”

Clearly, the students in this workshop described how the faculty mentor was attentive to the small groups and went to each group to discuss their progress in the research activity and how their network connected to other areas in their academics and career paths. I found that the attention by faculty mentors was a positive reinforcement of the students’ participation in research activities and the manner in which the faculty mentor integrated the research projects to classwork and career networking. As I observed the weekly workshops, faculty mentors who actively interacted with the small groups by asking questions, probing students for research progress, and lending academic advice, were described by the students as being involved and having a positive influence on their research-related activities and career aspirations.

When asked about their individual needs, students reported that they were also met as the faculty mentor went from small group to small group. They expressed feeling comfortable and at ease with the small group setting. Eric responded to the quality of his interactions with his faculty member, “I’d say it’s useful, definitely.” Sam responded: “Before going into the program I haven’t really had this sort of research, this sort of one-on-one experience with anybody. It’s kind of a new thing I’m still trying to get used to.

It's a new experience." Students appeared to feel that the research component of the program helped them not only to develop relationships with their faculty mentors but also connect to their classroom learning. Additionally, Jesus stated, "The research projects helped me to see how what I was learning in classroom can be used. That was the part I like. I like going to our workshops 'cause I work with my hands and learn stuff too."

Most students expressed that having a specific time to meet with their faculty mentors, on a weekly basis, supported their interests in research, their retention in the program, and their career development. For example, Sam stated, [Faculty mentor] has been present at every week to help us and has been very supportive of our project and she has provided guidance, constructive criticism, and even helped on funding for materials for the project. Students expressed that having a faculty mentor who was visible and interactive with their research-related projects reinforced their student-faculty relationships. Additionally, Eric remarked: [Faculty mentor] we are cool with each other. He's a great mentor and I'm taking a course with him. He has offered some job opportunities for me from some of his contacts in the industry. Mary responded, "My interactions with my faculty mentor are great. I have gotten to do some real research and we also discuss how my classes are going and what I want to do when I graduate."

The students shared how their interaction with their faculty mentors were not only related to research activities but also to their classes, career development, campus club organizations, and off-campus career and research opportunities. Their research activities had implications with career development, their interests in campus organizations, and off-campus internships and job opportunities. Linda stated, "[Faculty mentor] has recommended my research project to conferences and I went to the [conference] and

presented. I was scared, but I learned a lot.” Additionally, as I observed the interactions of the students and faculty, it was evident that their relationships were grounded in research and the faculty mentor’s willingness to share their professional knowledge with the students. Mary remarked, “I always learn something in my workshop. That’s how I became involved with the [name of campus club]. I like going to the meetings and we have a trip planned this spring.” Paco remarked, “I like learning from [faculty mentor] ‘cause I can talk to them in the small project group but also get to see what else is happening on campus.”

As the students in both groups shared remarks, there were distinct differences in the manner in which each faculty mentor interacted with their respective students. Not only were the interactions different but the focus of each workshop and related research activities. As the research activities differed between the two faculty mentors, the interaction between student and faculty mentor forged bonds to assist the students in solving research problems and addressing concepts related to their classwork and career development. Holly remarked: “The research helped me in my classes but also kinda helped me decide what I want to do when I graduate.” Another female student, Mary, shared:

One thing about the classes and the research is that they have a lot of group projects. We didn’t have that at my community college. This program really relies on people working together. I think the faculty made it that way.

Additionally, John stated, “I wish we had more hands on stuff in our workshops but I do like the information I get from the other students and from [faculty mentor]. The information has helped me with my classes and other teachers.” Here, faculty seemed to

have made the weekly workshops as a “connector” for students in their class content, but more importantly to their research related activities. The students have provided statements that reinforce their relationships with faculty mentors as research supporters and providers. The students also stated that their research interactions have helped them move forward in their career development.

Students expressed that the research they became involved in helped them in their respective classes and also assisted them making friends within the program. Sam stated, “Because I didn’t know anyone here, I didn’t have any friends but when I went to classes and got involved with the research you meet different people.” Yet John remarked, “I’m doing research with the Robotics club and it’s helped me with my classes in engineering and it also keeps me busy.” Linda stated, “I got involved with [faculty mentor] and joined the [club] and since he’s the advisor I was able to go to [conference.] with other friends from the cohort.” Not only does research assist the students with their respective classes, but also directly places them with various cohort peers who have like-minded aspirations.

Additionally, when the students were involved in research projects related to clubs and organizations they were also able to use these research activities for competitions and industry presentations. Several students attended professional association annual meetings where they presented their research. Linda stated:

I felt so good about myself and about what I had researched. I had never been to a conference before. I was scared at first but when I found out that I was gonna talk on what I had done and researched, I felt better and I just got up and talked.

The implication of student-faculty interaction on research has an obvious effect on the students of color and their self-esteem. This interaction with viable research can help to

build their self-esteem, self-efficacy, and ultimately heightened their ability to be retained to completion of STEM programs. Paco remarked: “My faculty mentor has given some research activities that have helped me with my classes. He is extremely positive and I feel he is genuinely looking at for my best interests.” Jesus stated: “She makes sure I have access to all the services and that I do work on the research project. I feel I can approach her with any problem I have and she can help me.” Finally, Eric felt: “Because [faculty mentor] is my mentor and also my supervisor for senior design, we interact a lot and I have learned lots of things from him during the current project. This senior design project has implications for intense research activities with the students’ respective mentors.

Not all students reported a favorable connection with their faculty mentor and research activities. John reported, “I haven’t really been involved with any research activities. I have been involved a little with the lab thing we just did. I have used it with some class stuff.” This student stated that there had been no formal research related activity afforded to him. Additionally, Holly stated, “I couldn’t really participate in the summer research or research during the semester because I had to work.” These two students expressed not being involved in research related activities which lessened their contact with faculty in research projects. The ability for a student to participate in research related activities strengthens the connection between student and faculty and also the exposure to research skills and related opportunities.

The link between the students becoming involved with research activities and their abilities to communicate with faculty are a direct link to their engagement with similar faculty research interests. In order for a student to become involved with faculty

research they must first attend the weekly workshops and cohort orientations. But probably most of all, communication directly with the faculty mentor influenced the students' ability to (a) obtain a research position, (b) interact and engage in research related activities, and (c) use the research faculty member as a true mentor.

### **Faculty Commitment and Caring for Students were Meaningful to Students**

When faculty appeared committed to research-related activities and included students, the relationship and commitment between students and faculty were viewed as favorable. Overall, students perceived the commitment as “my success in the program, in research, and as a student.” Faculty commitment and caring appeared to be important to students' general welfare, academic progress, research development, and career exploration in the student-faculty relationship

During my field observations, I attended several cohort orientations. These meetings are prescribed by the program to introduce a new cohort of students. Clearly, the cohort orientation was a positive influence on the incoming cohort group, but also projected a commitment to caring for students as they participated in research activities. The faculty mentors were eager to present the research activities. Paco stated, “As a new cohort member, I saw projects that the other students had done and it made me excited.” Yet Linda remarked, “The mentors seemed really involved with the research. Hope I get a project to work on.” Additionally, John said, “All the mentors were there and I got to see how they helped the students in the projects.” I found these students statements supportive of the cohort orientation and through this orientation students were given an opportunity to visualize the commitment to student-faculty research projects. Also, the

presentations of the faculty preceding the student reports showed the new cohort and others in the audience how the faculty was proud of the student projects.

Each mentor spoke about their research, any summer activities conducted, and weekly meeting activities. Some of the faculty mentors turned to their cohort of students to discuss and even the students displayed some of the research projects that had been conducted. Sam remarked: “This month I was asked to give a presentation at a cohort orientation meeting for the program. I talked about my failures and successes in the program. I met the new cohort and made many new friends.” Further, at an event that inducted students into the cohort, some students displayed projects from recent conference competitions and presentations. This activity allowed the incoming cohort to see what was available to them and how they can become involved, not only in the research activities, but also how their involvement in the program could impact their lives at a four-year university. Linda, who was in attendance, stated:

This was my first meeting and seeing everybody. Since I transferred from [local community college] I have not felt more comfortable and think that the mentors are helpful and I can see what I want to work on.

Here, a student expressed that this cohort orientation gave a sense of belonging to a specific group. In their description, this orientation also gave direction towards possible research-related projects as they progressed in the research program.

Students continually remarked about their perceptions of commitment and care to their college life. Their remarks focused on how commitment can influence and encourage their relationship with faculty, the university, and with career development.

What is also interesting to note, in regards to faculty commitment, is the perspective of a new cohort member who stated:

He takes this program seriously and even though he is an extremely busy man, he makes sure to have time to meet with us bi monthly. He has given us great advice on how to study, how to do well in classes and also how to do well once we graduate.

Here, students' statements appear to reflect their sentiments as to the commitment and caring on the part of the faculty. Faculty who take time, provide counsel, and display effort in assisting students with personal issues and academic concerns, are perceived to possess genuine concern for students' well-being.

Faculty who connect with their mentees from the start of their cohort involvement can begin to interact and that appears to later bond their relationships as the students of color progress in the research program. Additionally, Paco stated, "My faculty mentor is always willing to help me. I have had some pretty serious family issues just as I started the program and when I went to [faculty mentor] she helped me to get everything together. She listened and then gave me some things I needed to do. I felt better."

Here, these students expressed the nature of the student-faculty relationship and the manner in which the frequency and type of interactions impact their academic efficacy. As new students migrate into the cohort program, their impressions are important to note and to compare, not only for evaluation purposes to assess the assimilation process.

Time spent with faculty, relevant student welfare conversations, participation in research-related activities, and caring conversations regarding career development all

played a part in students' perception of faculty caring and commitment. On this point, Jesus remarked:

[Faculty mentor] talks to me about how important it is to do research but I need to work outside [the school] cause I need the money. [Faculty mentor] said my research can help me in my future. [Faculty mentor] helped me to understand it.

The perception of caring about their personal lives was important to the relationship between the faculty and the students. The faculty commitment to the students within the program crossed many variations, such as mentoring, career development, research, and academic advisement. Here, students reported that their interactions helped them feel wanted. Sam stated, "[Faculty mentor] mostly just guiding us along." Examining faculty commitment as it relates to research activities, a student reported that the participation in the research project had prepared him academically. Sam continued: "Well, it's prepared me at the same time. [Faculty mentor] asked me what classes I was taking. I took a topic from one class and she said, "How can you make this topic more relatable to others?" Eric stated, "This project is exactly what I want to do after I graduate. The research projects that I work on with [faculty mentor] really make me think."

When asked about the caring and commitment by the faculty on the students' academic progress, John reported: "I know the workshops are supposed to help, my workshops haven't really helped me. I feel all I do is listen to other students and their problems." Additionally, Alfredo remarked, "Guess I really don't know if [faculty mentor] cares except that [faculty mentor] helps me with choosing my classes but that's all." These two students' statements, however, did not represent the majority of comments made by the participants regarding faculty commitment and caring. Their

comments were personal perspectives and their inability to participate fully in the weekly workshops may have affected their vantage points of student-faculty contacts.

Faculty commitment to the research project and the students' needs supports the idea that faculty get closer to students and to reach out to them. This is evident in the responses from these study participants. Linda shared: "Before I been to his office I studied a lot to get a good idea but I went to his office hours and when I asked my questions he helped me to answer the problems I had." Another student reported, "He [faculty mentor] helped us to do better for the classes and he gave us information for how we can study for the classes and he was really concerned and if we had any question or problem, he helped us." These statements certainly solidify the faculty commitment not only to research activities but also to the academic success of the students. All of these are indicative to the academic culture of the research program. Additionally, Jesus reported, "My faculty mentor gave me a lot of new stuff to look up and helped me to think about my career goals." Students appeared to perceive faculty commitment through career and academic guidance.

Faculty conversations with students consisted of academic progress and personal issues. Clearly, the faculty mentors understood the relationship to a students' academic progress and their personal lives. Linda stated:

Okay, well my interaction with [faculty mentor], he's always here to help and to help you with any issues. He's always interested to know if I have any questions on the material in class or if I'm having any trouble. He's always available to help... so he's been very helpful. He also helped me study for my finals. I told

him there were some things that I was having trouble with, so I took him one of the sample problems I had and he went over it with me.

As can be seen here, the interaction between student and faculty displayed a true concern, commitment and caring for the student's welfare and their persistence with academics.

The commitment on the part of the faculty to assist with the students' needs and to project a reflection of caring can be seen across students' experiences. On this point, Eric shared: "He has been very helpful and very encouraging." Yet, Linda remarked, "[Faculty mentor] is very helpful, not only to me, but to all the students. He is the person who can solve the problem fastest." Additionally, Sam stated:

I met with [faculty mentor] last week to ask for her some help on applying for some internships for next summer. She helped me a lot as she was able to explain to me some of the things that the employer probably was looking for. She was very encouraging and also let me know what I had to work on to be more competitive. She also told me that she would help me with anything I needed like letters of recommendation.

Here, it is important to the student that the faculty mentor was able to lend some advice on career direction, internships, and summer research-related STEM activities. Faculty mentors who can direct students were found to be valuable to the student-faculty relationship and to the context of the research program.

The care and commitment to students was not only revealed in the face-to-face communication but also through special events initiated by the faculty. I witnessed one faculty mentor who showed deliberate evidence in commitment to student needs. On one occasion, the students were treated to a luncheon by the faculty mentor after the weekly

workshop. This luncheon not only served as a bonding session for the group, but also afforded the students to have a special one-to-one relationship with the faculty mentor. The faculty mentor went to each table at the luncheon and spoke with each student. The conversation was not related to academics but directed towards the personal life of the student and their holiday plans. Inter-personal communication between faculty and student helps to define faculty commitment to student success in the research culture as well.

### **The Effects of a Research Culture on the Student-Faculty Relationships**

The research culture appeared to be the foundation that moved faculty to engage students in meaningful research activities. A culture, as described by Spradley (1980, p.10), is the knowledge that people have learned as members of a group, and cannot be observed directly. Using this as a definition, the students of color participating in this research program appeared to have been exposed to a bonded culture that promoted student-faculty interaction. These faculty contacts have a direct effect on student relationships developed through research-related activities. The contacts included the faculty's ability to select students for research projects connected to a student's major, to career interests, faculty recommendations for conference participation and presentations, and faculty encouragement of students to participate campus STEM organizations.

Faculty who were readily available to students and support the research culture gave the students a positive outlook for career development in STEM disciplines. On this note, Eric stated, "I got more information about the electrical engineering major. It made me more interested to study harder and to get more knowledge about it." John remarked, "I am having a good experience. I learned more about the labs and equipment and how to

work with it.” These two very different quotes still reflect the link between classroom activities and the research culture. They seem to reinforce the students’ need to have relevant classroom content which they can relate to research activities, but the supplemental activities such as the labs also provide links to the research culture. The students seem to need classroom content and supplemental activities to link their research to their academic success.

Faculty who provided activities and relationships that engaged the students seemed to be a common theme as they spoke about the research culture of the program. Here, Paco reported, “Particularly with [faculty mentor], I find that I am a lot more comfortable speaking with her. Not only on an academic level but personally too like interests and what I want to do after [undergraduate university] and what I want to do as a career.” This statement may provide evidence that supports from the faculty mentor, both academically and personally, helps the student gain access to opportunities and to develop a positive and caring relationship with faculty as well. Jesus summed up the academic culture as it relates to student-faculty research relationships by stating:

Sometimes I go to her [faculty mentor] office just for advisement for my major and sometimes we talk about classes that don’t count for my math major and my computer science major. Other times I just ask her [faculty mentor] what she’s interested in.

Creating an academic culture also includes success strategies introduced not only from the student-faculty interaction, but also from components within the research program. As Alfredo stated, “The projects that I work on has helped me in class and also for my internship. I feel like I can finish [undergraduate university] and go on to be an engineer.”

The interactions of student and faculty, assists students of color to become a part of a culture which emphasizes a commitment to research and academics which leads to persistence to graduation. Students express a sense of belonging and hope.

As we know, students experience good times and sometimes negative experiences as they go about their college lives. Supports within programs are assists to students. The academic culture is greatly influenced by the faculty and their commitments, supports, and professional expertise to the students. Paco remarked, “My faculty mentor has really lent her help to me. I recently went through a rough period of depression and [faculty mentor] has been there to help me in any way she can. I felt her support and it has helped me feel more secure. This month I met with her twice to discuss my goals and for some academic advising.”

Observing the students as they participated in their weekly workshops afforded the opportunity to visualize the exchanges between student-faculty. Although one session was conducted as a forum for the students to discuss their challenges with courses and assignments, the connection between the student and faculty mentor was one of caring, trust, and mentor-mentee relations. For a student to “open up” to a faculty mentor with their peers in close proximity speaks well to the academic culture and also to the student-faculty relationship. However, in another observation session, the culture of the workshop was geared to problem-solving and critical thinking. This workshop had a goal of completing a specific project and the student-faculty relationship and culture differed. Although there was evidence of the “relationship-centered care” in both instances, the tone of each differed tremendously. The research culture is an important aspect of this program and how each workshop differed was reflected through the students’ comments.

The generated culture of each workshop reflected with the level of engagement by each student participant.

Mary reported that, “She always helps us and has even brought in other grad students and peer volunteers to help us with the project.” Yet, Eric reported: “My interaction with him is mostly at set-up but it’s been OK. He’s a smart guy and I learn from him. It’s best to have your questions ready for him to answer.” Paco responded, “I have seen and contacted my faculty mentor multiple times. I have become very comfortable with [faculty mentor] and see her with any concerns that I may have. She is a great deal of help and does not leave any questions that I have unanswered.” Additionally, Alfredo stated, “Even though [faculty mentor] is hard to get to he is helpful and knows a lot of people that can help me. I just wanted to get involved with his summer project ‘cause I knew it would help me to go further.” These responses to the student-faculty and academic culture of each group differs, but they express the level of commitment that faculty possess. As I interviewed and observed the students, it became evident that the research culture had many components.

Another important aspect of the research culture was that of research activities. One of the primary relationships between the student-faculty was that related to the research activities. One of the main components of the program is for the students to be actively involved in some type of faculty research. Through my descriptive observations and interviews, I ascertained several important insights into the students and relationships with the faculty research. Holly spoke about research by stating, “I did some reading on what [faculty mentor] told me to research. She helped me and advised me to get involved and showed me something I can do in the group [research].” This student was new to the

research process and relied on the faculty mentor to guide and advise her. Conversely, John stated, “I’m only working on projects for classes with other cohort people but nothing with [faculty mentor]. I think he plays favorites ‘cause he never asks me to research with him.” This student was “out of the research loop.” The student’s candid comments are a clear reflection of the student-faculty research relationship. Clearly, this student did not hold a positive image towards in respect to their relationship with the faculty mentor.

The value of having students attend conferences and to even present at the conference reflects the belief system of the students that these activities contribute greatly to the student-faculty relationship as well. In fact, students as they perceived their value to being admitted to the program was to increase their research skills and lead to career development in their chosen STEM disciplines. The students who had attended outside professional conferences and even presented at these conferences reported a strong bond between their self-rewarding personal experiences and its direct relationship to the academic culture. They expressed being prepared and “groomed” to present their research. Here, Paco remarked:

I’ve been involved with a project presentation. I was in charge of creating poster for a conference our group will be presenting at. I have also been involved with the Computer Science and Technology Club.

Additionally, Linda remarked, “I really liked traveling to a new place and presenting my research project. I was glad I was selected to go with the club. I was scared at first, but it turned out fine. I think this program has helped.”

## **Interaction between Students and Faculty Enhanced Academic Progress**

When students interact and communicate with faculty they form connections through discussions about in-classroom activities, supplemental labs, research related activities, and their academic progress. The conversation between student and faculty helps to form connections not only to the students' academic progress but also to building the foundation of quality student-faculty relationships. My observations and remarks made by students clearly showed how the effects of the communication assist the students with academic strategies for success.

As an example of the effects of student-faculty interaction on student success, during the descriptive observation process students were seen developing strategies in their weekly workshops to propel and their own academic success with a support system regulated by the faculty mentor. For example, students in one weekly workshop structure were given the opportunity to express concerns regarding any particular class, assignments, and/or projects. As a group, strategies were presented to mitigate any individual concerns. However, the structure for this exchange was pre-determined by the faculty mentor. Alfredo reported, "We sit around and discuss coursework, problems, how are doing and feeling, peer tutor stuff. Really not a lot about research... I could be spending my time better especially since all this happens at 5 o'clock on a Friday." Additionally, John stated: "We sit around and everybody tells what's bugging them about their classes. Sometimes we go to the Lab... but not always. I don't like the late meeting time on Friday. Especially since I have to listen to the cohorts complain." The structure of this weekly workshop serves a sole purpose of assisting the students in developing student success strategies; however, the strategies seemed to be less focused

on the relationship between the student-faculty, but rather the peer-to-peer relationship. During the descriptive observations, it was clear that the faculty mentors did guide the concerns and assisted the students to form productive strategies.

The interaction between students and faculty mentors was described by Eric in his statement: I strongly advise students to get as much advisement. This statement clearly indicates the student's perception of faculty advisement. However, the most compelling response in regards to success strategies and student-faculty interaction came from Sam, who shared:

My experiences have changed since my advisor is my academic advisor and also my faculty mentor. It's good because I already know her and she knows me. The relationship builds even stronger. Whenever I go for advisement she knows what to expect, she knows what classes I need and what classes are going to get me what's called a double count...and it makes it a lot easy that she knows me already.

Most students consistently stated that their relationships with faculty enhanced their academic progress either by advisement or by participating in research-related activities. Holly responded: "My faculty mentor helps me pick classes but also tells me how the classes can help me to graduate." Yet, Mary stated, "[Faculty mentor] and I worked out a schedule to help me work and participate in research projects but not hurt me passing my classes. Yeah she was really helpful."

Transfer students of color present with many challenges and their healthy student-faculty interaction can help alleviate and diminish some of these challenges. As I

interviewed and observed the students, it was evident to me that their perceptions of faculty involvement with their success differed from student to student.

Student success strategies were expressed in various ways. Each student reported personal beliefs on their perception and level of faculty involvement to their academic success. Not only was the student-faculty interaction an implication for student success strategies, but that interaction between student-faculty extended into developing relationships between the peers. On this point, Paco stated:

I would say the guy that is from my [ ] class. He's very positive. He helped me a lot in the lab because in the first lab I was not sure what was happening. My faculty mentor suggested I get in touch with him. I realized he's from the program so that made me more comfortable and friendly. He's just a positive person in general so it helps in the class. If my faculty mentor hadn't said anything I'm sure I would still be lost.

Eric, who was particularly excited about research and his academic success stated, "I see myself making it towards my goal of graduation. I also look forward to participating in a summer research program such as I did last summer." Conversely, John remarked, "I'm not sure that when I meet with my faculty mentor that they help me in my classes, I just get my OK for the next set of classes." Additionally, Alfredo said, "I just go to class and the only contact I have is at the weekly workshops." It was evident, that student perspectives differed, but all the remarks were able to portray different lens into the program.

Faculty involvement in student success was displayed, in the reports made by the students, in a variety of methods. Direct interaction with faculty was one of the methods

expressed by students. Face-to-face interactions appeared to help enhance networking opportunities that faculty mentors were able to pass along to them during these interactions. Additionally, students reported that faculty mentors appeared helpful with academic strategies and class selection which best fit the individual needs of students.

Holly stated,

Well, usually when it comes to conceptual questions and you are given a choice to answer, I do better when I get to explain myself. For all the other classes I've had, they've been great experiences. A lot of the times I notice that professors like to go by what they know and they're experiences are kind of what they teach as well as what's in the book. It's really helpful.

Clearly, this student transcended his inter-personal interaction with the faculty mentor's style of teaching into an academic strategy. Eric reported that through his interaction with research, his success levels were heightened. He stated, "My fellow research assistants and I finished our papers and presentation. We gave an interesting and well-done report and received positive feedback from our professors and audience." This student and his peers have integrated their class work and research activities into successful strategies of academic success which has possibilities of leading to career development.

Another subtheme in examining academic success strategies revealed the students' use of the scheduled tutoring and peer mentoring. Many times, students reported that their faculty mentor strongly suggested them using the tutors available in the program. However, Sam stated:

Um, my class experience wasn't really that difficult. I was able to pass my classes. I'm able to utilize tutoring and all the other help from the program as well. My faculty mentor told me to look into all the help in the program. So I did and I have a couple friends that actually I have studied with that helped me with my classes too.

As seen through my observations, the academic culture within the two groups differed; however, in that, one of the groups had a clear sense of faculty actively expressing specific strategies for student success, whereas, the other group was more related to problem solving through peer to-peer collaboration and faculty exercising "suggestive type problems" to small groups of students. Both strategies seemed to work well and the success of both relates back to the academic culture inherent within each group. Further interviews revealed that students felt differently about their groups, but all were positive. For example, John expressed, "We sit around and discuss coursework, problems, how we are doing and feeling, peer tutor stuff, not really a lot of our direct research." However, Mary felt,

She spends time with us. She gives us announcements about different things. She watches our projects and makes suggestions. She makes sure she meets with each group. She's been helpful to me.

Any relationship to faculty seemed to make a mark on student satisfaction. Even though the student-faculty relationship differed in success strategies, the student satisfaction still remained and would lead to student retention in the program. Students genuinely expressed that their interactions with faculty enhanced their academics, but their

relationships were strengthened through communication and feeling as if their faculty mentors “met their needs.”

### **Student-Faculty Relationships Help Students of Color Faced Challenges with Transition**

Transferring from a local community college or even another four-year university presented some challenges as the interviews and observations revealed. Although not every student interviewed revealed their personal challenges, some did express some experiences that they perceived as challenging. The challenges included personal issues, financial, social, and emotional issues. Students revealed that as they met with their faculty mentors, the relationship assisted them in dealing with the challenges of transferring. The faculty mentor was able to provide strategies for easing the transition to the four-year university, adjusting personal lives, and providing career development opportunities. Through their communications with the faculty mentors, students revealed their challenges with the transfer process.

Students expressed that their transfer experiences had both positive and negative effects on their academic success into the four-year university. Linda, reported, “Well at the beginning I was worried like because I’m going somewhere new and all this stuff, but no it’s completely good. Like everything was friendly, professors are friendly.” Several students expressed the same sentiment as this student, who stated,

My first semester was pretty tough because I didn’t know anyone here but the first few weeks I was taking classes and met a lot of people. They were really helpful and showed me around with engineering but not so much the rest of the campus. I joined the program for the spring semester and that helped a lot more.

Yet, Mary stated, “I learned time management to do well in my classes.” Additionally, Linda responded,

I have improved my study habits as well as my time management. I have started being more efficient in blocking out my time to study for specific classes, and planning ahead to when I know I have tutor availability. My first semester has been very overwhelming, but I feel like I am getting in the flow.

Additionally, John remarked, “I just kinda kept quiet and low profile. No one really helped me. I figured it out on my own.” Another student said, “I wasn’t sure about what classes I needed, I guessed based on what I took at community college.” These last statements clearly show that students were not always supported in their transfer efforts and faced challenges in the process.

The students reacted to challenges in transferring in different ways. Transfer students do experience various levels of social and emotional culture shock due to the difference in a community college and a four-year university. Their communication and their established relationships with faculty mentors helped to ease some of the challenges they experienced. The face-to-face contacts were helpful. The discussions regarding their family lives, financial issues, and career development all assisted the students in finding strategies to cope. Eric remarked, “When I got to [undergraduate university] it was hard. But I did get involved with my faculty mentor and learned the system by talking to him.”

Through interviews some students, some expressed specific transfer challenges and how their relationship with faculty has helped them in the process. Sam stated, “My faculty mentor helped me in scheduling classes that I can do well. I was scared about that, so I didn’t take a lot of classes.” By soliciting help from a faculty mentor, this student

found that one way to diminish some transfer challenges was to schedule less of a class load. The communication between student-faculty connected the student in the direction of a successful academic strategy. Yet, Paco remarked, “My advisor helped me to understand the university thing. I wasn’t sure what classes to take and [faculty mentor] helped me figure it all out. I just went in to see [faculty mentor.]” The relationship with faculty mentors helped the students make connections to academic strategies and to ease the transfer experience. It was clear that the perceptions of the student-faculty relationship were important to the transfer experience. It is also interesting to note that most of these students transferred from local community colleges which had a program similar to the program at the university. However, the interactions between the student and faculty were enhanced once the student arrived at the university. Students did express that their relationships with faculty at the local community colleges were minimal and in some cases non-existent. Sam stated, “I was involved in a STEM program at [local community college] but nothing like here at [university]. It didn’t really help me but gave me the opportunity to come here. I never really talked to my teachers except for class stuff. So when I came here and was able to discuss everything-that just made it better for me.”

Additionally, other challenges presented to transfer students of color are their perceptions regarding university faculty. As I interviewed the student participants, they expressed that university faculty could be intimidating due to their vast level of knowledge and involvement in research projects. However, even though a student may be intimidated, they did feel that interacting with the faculty held value in their academic success. Mary responded about university faculty perceptions by stating, “Interacting

with faculty... been able to cultivate my relationships and that is key to progressing.”

Yet, Eric simply stated, “Transferring was easy.” Interestingly, Jesus stated, “I learned to work with other people and that you can get anything done if you really work with each other, communicate well.” This student’s perception of transferring into the university clearly revolved around his ability to communicate and work with others.

Other challenges facing transfer students of color relate to financial issues and articulation agreements between the two-year colleges and four-year universities. By the time the students spend a significant amount of time in the two-year college setting, their financial aid may be decreasing which increases their economic pressures. The relationship and communications with their faculty mentor can help the student to understand and negotiate strategies to ease these issues. Eric stated, “Transferring courses were crazy and I hope I have enough financial aid to finish. But when I met with [faculty mentor] I realized that I didn’t have to take as many courses as I thought.” Yet, Paco remarked, “I’m glad I saw my advisor ‘cause now I understand the courses I need to take and how the summer research can help me financially.” I found that students who communicated their personal challenges about transferring to the four-year university with their faculty mentor were able to navigate their experiences and it strengthened their trust of student-faculty relationships.

The overall feelings from students expressed their pride and satisfaction about being involved in a research culture and a program that could advance their career interests in STEM disciplines. Their satisfaction related to their relationships and communications with their faculty mentors. Sam summed up their experience in transferring by stating: “The experience of going to a university has given me great

advice to become a better student with the increasing workload. It helps coming from those more experienced with the somewhat chaotic system.”

New cohorts have various experiences as they transfer. It was interesting to hear some of their perspectives as it relates to student-faculty relationships, peer relations, and the transfer experience, in general. Linda remarked:

As a cohort participant, I have been able to apply some of my prior knowledge to the project we are currently working on. I have acquired lots of knowledge about classes. I need to take in the future from my cohort participants. It has also helped me adapt to the new environment here at [four-year university].

Transfer students of color do experience unique challenges; however, when they are supported by faculty and participate in a cohort model, their challenges are diminished significantly. This faculty research program has support systems in place to assist the students in mitigating challenges and to become successfully academically and socially in the larger university. Additionally, Jesus stated,

I'm a more confident student because of all the exposure I've gotten into fields that are related to our learning curriculum in the classroom. I have better knowledge about projects and it makes me more social also. I feel more comfortable in the social setting and with my mentor because I know more about certain topics.

Here, this student expressed that their participation in this faculty STEM research program opens doors for future opportunities and that the classroom activities relate directly to their career and research interests. It appears that students of color who participate in faculty research programs with intensive supports such as research-related

projects, conference participation, career networking opportunities, and face-to-face communication strategies experience success in career exploration. Additionally, students of color that appear to have meaningful relationships and interactions with their faculty mentors assimilate better into the 4-year university culture. As students of color assimilate into the 4-year university, their research appears to help them become better students academically. Within the context of research, students of color appear to use their STEM research to further their career goals and career aspirations in the STEM fields.

### **Chapter Summary**

This chapter described the experiences of undergraduate transfer students of color as they are participating in a faculty research program. My specific emphasis was to examine the student-faculty interaction and the relationships as they participate in the research program. Six cultural themes emerged from this study: (a) frequent communication promotes student-faculty contact, (b) the structure of student-faculty relationships and research workshops facilitate faculty contact with students, (c) faculty commitment and caring for students were meaningful to students, (d) the effect of a research culture on the student-faculty relationships, (e) interaction between student and faculty enhanced academic progress, and (f) student-faculty relationships help students of color face challenges with transition.

The first theme that arose in this study was the role of frequent communication promoting student-faculty contact. Participants showed that their primary forms of communication were through emails and face-to-face contact. They expressed that these methods of communication were the most effective. Other forms of communication

included their weekly workshops, supplemental labs, and participation in campus organizations. However, these secondary forms of contact with faculty most likely emanated from their initial emails and subsequent face-to-face contacts.

Another theme that emerged was the structure of student-faculty relationships and how research workshops facilitate faculty contact with students. Participants identified specific examples of how their weekly workshops assisted in their faculty contacts. Students, in one weekly workshop, remarked positively about their experiences with their research, the faculty mentor's ability to connect with individual group members and collectively to produce a research project. Yet participants from another weekly workshop group had expressed mixed feeling about their relationship with their faculty mentor and the contacts that may not have been as strong. However, most participants identified that the weekly research workshops did have a strengthening connection for their student-faculty contacts.

The third theme that arose was faculty commitment and care for students appeared to be meaningful to students of color. Participants expressed very passionately their feelings regarding faculty's support to caring and committed environment. Their feelings were based on how faculty responded to their personal and academic needs. Also the students expressed that the cohort orientation gave them an insight to the compassion and caring the faculty had towards research. In addition, participants built their relationships with faculty based on their perceptions of caring and their commitment to their personal needs.

One other theme that emerged was the effects of a research culture on the student-faculty relationships. This theme was the foundation that determined how the faculty was

able to include selected participants in meaningful research activities. The culture of the program revolved around research; however, not all students were selected to participate, but all were encouraged to apply to specific projects and research activities. Although there were “big” research projects based in the culture of the program, there were many opportunities available to students within their weekly workshops.

Participants were able to cultivate stronger relationships with their faculty mentor by participating in research projects. The initial initiative comes from the student and it appeared that most students began their research process and activity from their face-to-face contacts with the faculty mentor.

The fifth theme that emerged was interactions between student and faculty seemed to enhance academic progress. Participants expressed that their faculty mentor was the one source where they could obtain information on scheduling classes, learning the sequencing of classes, obtaining information on STEM disciplines, and learning general information on STEM careers. Their connection with faculty occurred during face-to-face advising sessions and email contacts. Participants also expressed that their involvement in campus STEM discipline organizations furthered their interests and also assisted in their academic progress. Their comments suggested that their faculty mentors helped to engage their participation in research activities, helped them to stay on track academically, and also supported their career development.

Lastly, the final theme was the student-faculty relationship helping students of color to face challenges with transition. As previously discussed, transfer students of color face many challenges as they transfer to the four-year university. These challenges include academic challenges, social and emotional challenges, and financial challenges.

Forging a relationship with faculty mentors has been a positive advantage for most participants. They expressed that the cohort orientation was, perhaps, their first encounters with the faculty mentors and meeting them eased their minds significantly. Additionally, participants agreed that although these challenges were present, they were able to rely on their faculty mentors to help them mitigate some of the negative aspects of the transfer process. Only a couple of participants expressed not have the support of their mentors and this may be because they did not reach out to their mentor for help.

In the next chapter, I will discuss the findings of this study. Additionally, I will provide recommendations based on the findings. From this study's discussion of findings and recommendations, I hope to use this examination of the student-faculty interaction as the lived experiences of transfer students of color. Hopefully, their lived experiences will guide future research and policy for students of color participating research programs.

## CHAPTER FIVE

### DISCUSSION AND RECOMMENDATIONS

#### **Introduction**

The U. S. ranks 27<sup>th</sup> among developed nations in the proportion of college students receiving undergraduate degrees in STEM disciplines (Scott and Martin, 2012, p. 6). In fact, the U. S. struggles to keep up with the high demands for a skilled labor force in the STEM disciplines but has the ability to ensure that students of color are prepared to enter the fastest growing and highest paying occupations of the future (Scott and Martin, 2012, p. 3-6). Acknowledging the importance of improving the STEM labor force for students of color, this study was important to conduct. Students of color are severely underrepresented in STEM enrollments in higher education.

The literature addressing the gaps of STEM enrollment for students color also had another distinct gap present. Literature did not address transfer students of color engaging in faculty research projects, even though there are numerous grants awarded to heighten the education for this student population. Additionally, the scant literature made little mention of student-faculty relationships and the impact of these relationships on the experiences of transfer students of color as they participate in faculty research programs. As a result, I explored the experiences of transfer students of color as participated in a STEM faculty research program in a regional urban public four-year university located in the southwestern portion of the United States.

In this study, I examined two research questions related to student-faculty interaction 1) what are the experiences of transfer students of color in a faculty research program in engineering and computer science fields at a regional urban four-year public

university? 2) how does student-faculty interactions shape the academic experiences and career aspirations among transfer students of color in engineering and computer science fields at a regional urban four-year public university? Using the transcribed interviews and comments by nine students, participating in a STEM faculty research program, I organized and coded themes to align to the conceptual and contextual lens of the study. In addition I used participant observations and document reviews to all also understand the participants lived experiences while participating in the research program.

Using these procedures, six cultural themes emerged in this study: a) frequent communication promotes student-faculty contact, b) the structure of student-faculty relationships and research workshops facilitate faculty contact with students, c) faculty commitment and caring for students were meaningful to students, d) the effect of a research culture on the student-faculty relationships, e) interaction between student and faculty enhanced academic progress, and f) student-faculty relationships helped students of color face challenges with transition.

This chapter offers an interpretive understanding of the experience of transfer students of color as they interact with faculty while participating in a research project. The chapter ends with a discussion of the implications for future research and recommendations for practice.

## **Findings**

### **Experiences of Transfer Students of Color in a Faculty Research Program in Engineering and Computer Science**

This first research question that I sought to answer guided me through an exploration of the lived experiences of transfer students of color as they participated in

the faculty research program. I discovered that the students had many different experiences including their relationships with faculty. There were mostly positive and rewarding experiences as the students of color participated in the faculty research program. Several students admitted their relationships with faculty were not consistent or offered support to their academic progress. However, research has supported that student-faculty relationships are important to the retention and persistence to completion for students of color.

Another experience was the manner in which they communicated with faculty. Face-to-face contact and emails ranked as the most useful for students. Students expressed that they liked “sitting down” with faculty and discussing all aspects of their lives including academic progress, social and emotional issues, as well as their participation in research projects. Their communication with faculty assisted them in pursuing academic and time management skills to sustain their retention in the program.

As Rendón posits (2002, p. 642-667), the time spent with faculty equates to their validation of caring and commitment from faculty. Faculty are, therefore, validating a student’s feelings and concerns regarding their academic journey. For most students, their time with faculty was well spent, informative, a guide to class selection and academic progress. Students openly admitted that faculty helped them with internships, summer programs, and summer research. There were, however, a few students who felt that their time with faculty was “hurried,” unstructured and only useful in the selection of classes.

Students participating in the program also had research workshops. These workshops were weekly and were discipline specific. The computer engineering and the engineering group met on a weekly basis. The focus of the groups differed and the

comments expressed by the students did as well. The computer engineering group found their faculty mentor to be sensitive to student needs and the workshop was designed to have the students work in small groups. The students expressed that the small group work helped them to focus and stay up with the group as a whole. The faculty mentor was also very helpful in exploring their research interests and skills. The group worked on a specific project and everyone played a part in its design. The engineering group also had weekly workshops and their focus was much different. Their workshops were designed to assist the students in their academic issues. The faculty mentor designed this group more along the lines of a seminar, which gave the students the opportunity to express their concerns with research, classes, and even other faculty. Some students expressed that they did not feel comfortable in discussing personal issues, while others were very comfortable. These students felt that the exchange between peers and faculty were beneficial to their needs and to their progress. It was evident that the structure of this research workshop did affect the structure of the student-faculty relationship and may not have positively facilitated the contact these students had with faculty.

Rendón speaks to the issue of validating students of color through commitment and caring in their educational journeys. One of three strongest cultural themes that emerged was faculty commitment and caring and how it makes a difference, especially for students of color. One of the most vivid premiere experiences that the students were exposed to was cohort orientation. This was, perhaps, their first encounter with the program, faculty, other cohorts, and support staff with the research program. Students expressed that this experience helped them to see and to feel the commitment by the staff for the research and for the program. Further, students also discussed that this orientation

displayed a true caring atmosphere and they felt welcome into a research program.

Additionally, students expressed that they had positive experiences in discussing personal issues which portrayed caring by faculty. They were able to verbalize private thoughts to faculty who assisted the students into positive action plans. Students also expressed the commitment by faculty for research. The commitment to the research was not only for specific projects but also to assist the students in gaining the necessary skills to conduct valuable STEM research. Only one student remarked that he had not been afforded such an opportunity to be a part of a research project. I sensed that there may be other issues leading to this declaration.

### **Student-Faculty Interactions and How They Shape the Academic and Career Aspirations of Transfer Students of Color**

This question was found to have the widest gap in the current literature as it related to students of color participating in a faculty research program. This made the comments from the students very important, not only to this study but for future research. Since the students were immersed into an academic culture that featured research as a main component of the program, the reveal of the data pointed to the effects of this research culture on the experiences of the participating students. This research culture was actually the foundation that moved the faculty to engage the students of color into meaningful projects. Faculty attempted to align the research projects to classroom assignments and subject matter. Students expressed that this design was helpful for them in understanding the classroom topics. Here, Rendón's validation theory supports the study's findings, wherein, students felt that their academics, research with faculty, and

their communication about their research projects validated their interests and connected them their classroom studies.

My experiences of observing the research workshops afforded me the opportunity see first-hand how the effects of the research culture affected the relationship between students and faculty. Faculty appeared genuinely helpful, focused, and motivated to have positive relationships with the research and with students. Many students had presented at conferences and to the program's industry and community partners. However, there were several students who had not presented but had expressed a desire to do so at conferences. Their sentiments included a feeling of being left out or that a particular faculty mentor had favorite students that were pushed to always present and to do extra research-related work.

Additionally, several students were also excited to say they had presented at a cohort orientation. Their pride was beaming as they explained their projects and who they had presented to. Their involvement with research presentations is a true testament to the relationships that faculty forged with students and how the research culture is the foundation by which the relationship is all possible. One student expressed that faculty were "grooming" them for research. Truly these opportunities helped to shape the research experiences of the students of color.

Another emergent theme-the interaction between faculty and student and the connections to academic progress helped me to answer my second research question. Clearly, this program supported academic and STEM career missions. Interactions between faculty and students were expressed in various form, but all related back to retaining the students of color to complete the program and to be afforded valuable

research opportunities. Students expressed their satisfaction with the structure of the program and how they felt faculty assisted in their academic progress. However, some students expressed that a deep connection with their faculty mentor was lacking and this may have affected their ability to participate fully in research-related activities. Even though the students meet with their faculty mentors, some lamented that due to their work schedules, the meetings were mostly related to scheduling classes, although their desires were to meet for more meaningful connections. However, the majority of students felt that the interaction between student and faculty resulted in face-to-face meetings discussing not only academic progress and class selection, but also career directions and even personal issues.

Further, the weekly workshops also gave a solid opportunity for faculty to interact with the students in small groups and in a larger seminar structure. Faculty had designed specific success strategies for the program, for individual courses, and for the research opportunities. Also included in the structure of the program were supplemental labs. These labs gave the students opportunities to attend on a scheduled basis and obtain additional academic skills. However, in interview the students, not many actually attended. They expressed that time did not always allow it in their schedules and some even stated they did not know about the labs

Inherent in Rendón' definition of validation (1994, p. 33-50), she addresses the validation process as enabling, confirming, and supporting academics both in and out of class. This process fosters the interpersonal development of students of color. Students shared that the interactions with faculty, both in and out of the classroom, helped them in their career aspirations and their academics at the four-year university. Faculty felt like

confidants, advisors, and also career counselors. Students looked up to their advice regarding STEM discipline knowledge and research.

Lastly, the student-faculty relationship was evident in helping students of color face transfer challenges. This theme related to how student-faculty interactions do shape career aspirations. As transfer students, the students face many challenges, and as students of color, their challenges can multiply. The relationship with the faculty becomes paramount to their survival. Their survival and retention is driven by the student-faculty relationship. Included in their relationship are the advising and career “talks” the students referenced frequently. These talks assisted the students in learning about the relationship between the research and their academics. Relationship with faculty also afforded the students with opportunities to align their research with any career aspirations they may have had. Faculty was also available to provide specific career opportunities and advanced academic programs in specific fields.

Further, since this program utilizes a cohort framework, learning communities, such as these, foster and perpetrate persistence in students of color. The commitment of faculty to reach out to students of color with contemplative practices, journaling- time for reflection , and research-related activities-helping problem-solving and critical thinking skills, supports the social and emotional assistance that students of color need in college (Rendón, 1994). Further, my findings also indicated that faculty mentor groups facilitated a network for their interactions with students in research projects. Faculty mentors frequently interacted between themselves and the students within the cohort. These interactions afforded the students the opportunity to participate in various summer research-related projects and also conference presentations. The cohort structure

supported the STEM academics but also the research-related activities. Sam stated, “I like the cohorts. I like working with all my peers. I see some from my old community college.” Additionally, Linda stated, “I worked on a summer research project with another faculty mentor. I liked that and I learned different stuff.” Yet, Eric responded: “The cohorts are great. I know some of the students but I met different ones who work on the same projects with me. The summer research was good too cause we really hung out and worked in the summer.”

In conclusion, my research questions posed an opportunity to examine student-faculty interactions with a descriptive and observable lens. The work conducted by Kim and Sax (2009) reflected the data revealing the frequency and quality of student experiences in research-related program; however, the literature was not specific to the quality of the interactions and the types of relationships that students of color formed with faculty as they participated in faculty research programs. I found that the student-faculty experiences of transfer students of color greatly influenced their efficacy in a STEM research program.

As Rendón (2009) discusses the “commitment to care” and how this influences the experiences, the relationships and interactions between students of color and faculty, the findings of this study supported this theory of being “cared for.” Participants reported, in detail, how they felt supported and “cared about” from their faculty mentors. Their experiences described a caring climate as they participated in research-related activities, explored career aspirations, and participated in internships and conferences, all from the guidance of their faculty mentor. Most students of color felt that their faculty mentor

listened to their needs, gave them academic and personal advice based on their expressed needs.

This study attempted to lend a more in-depth and observable lens due to the small sample of students which provided me with the ability to learn and discover intimate details of the transfer student of color experience. Further, it was also important to examine the method of communication that the participants identified, contributing to student-faculty interaction. In past studies, the “typology” (Cox and Orehovec, 2007) describes the type of interactions and these are influenced interactions that are said to be fluid in nature. This study attempted to reveal the same truth; however, examining the fluidity of these types of interactions was crucial to the findings. In fact, the faculty-research program studied here revealed that the fluidity of the communication types was not only inherent into the context of the STEM research program, but that its construct depended on the fluidity and type of the interactions. The use of emails and face-to-face communication was an integral part of the research program and the students and faculty used these methods to communicate on a regular basis.

Lastly, this study attempts to contribute additional knowledge of students of color participating in undergraduate research in STEM disciplines and statistical data revealing enrollment of underrepresented students. However, combining the STEM research data with an in-depth understanding of the experiences of transfer students of color, a unique sector of the undergraduate population, as they participate in a faculty research program gave a descriptive quality to the student-faculty relationship. Transfer students of color were rarely mentioned in the literature which made this study necessary to conduct. All transfer students experience challenges, but students of color are even more vulnerable.

Programs such as the one described in this study attempt to lend significant supports both academically and emotionally which helps the student of color assimilate into the larger four-year university. Coupling this support system with participation in a STEM faculty research program gives an even broader opportunity for retention and program completion. Yielding first-hand and lived experience of this unique student population, further supports the need to continue the valuable funding allotted by the U.S. Department of Education and other government related agencies and private sources.

### **Recommendations and Implications for Future Research**

This study sought to examine the lived experiences of undergraduate transfer students of color as they participated in a faculty research program. After presenting and interpreting the results and findings of the study, I have provided recommendations for future practice and research. Participants of the study expressed that they enjoyed being a part of a faculty research program. They expressed that they would never have these types of opportunities had they not transferred from their local community college to this four-year HSI. They were excited to be a part of the program and felt that their futures were bright with opportunities in their chosen STEM disciplines. Their interactions with faculty assisted them academically, socially, and for their career exploration. However, several specific recommendations emerged through this study that may impact for more positive relationships between students and faculty.

### **Research experiences**

Specific recommendations for examining student-faculty relationships within this program include identifying those students who are expressing concern regarding their involvement with research related activities. Even though students are selected for

research projects, every student should be afforded the opportunity, if only to provide research support on any particular project. Not only will this help the student attain a level of confidence in research, but also provide additional research information for any federal funding to STEM research programs with students of color.

### **Weekly workshops and expanding themes**

Additionally, weekly research workshops could have specific goals each week and present a common theme each week. Students expressed that in some weekly workshops, the theme did not continue and the session may not have been as useful for their individual needs. Perhaps, a weekly assessment tool could be administered to identify relevant topics for discussion. Research projects being conducted in the weekly workshops should be photographed and put to power point in order to preserve the research environment and also for future reproduction. This would also afford future students of color the opportunity to examine projects that may be of interest to them.

### **Structured communication**

Communication appeared to have an effect on the student-faculty relationship in many ways. A recommendation in regards to the communication would be to strengthen the process by requiring a specific number of “check-ins” with each faculty mentor. Also a recommendation for the student-faculty meetings would be to have individual plans for each student which would include academic progress, classes still needed, research projects currently involved in, career aspirations, internships, and summer research projects. Email, phone contacts, and any other communication processes could be recorded and tracked. The faculty would be able to set goals with the students, use this

program folder as an assessment tool for retention and completion, and also for program evaluation purposes.

### **On-going industry partnerships**

STEM career aspirations are important to establish with students of color. Students did express that they enjoyed discussing career possibilities with faculty. One recommendation would be to strengthen the industry and community partnerships. Every student should have a recorded opportunity to become involved with a research project, internship, or summer employment with an industry or community partner. This would assist the student-faculty relationship, but also help the program with retention, persistence to completion, and assessment of their research goals.

### **Expansion of study through cultural themes**

For future research studies, I recommend extending this study and identifying each cultural theme as an individual study. Clearly, there is more information to ascertain from the cohort participants as they are retained through the program. In addition, the study of student-faculty interaction with students of color participating in a faculty research program needs to be studied more in depth. Due to the scant amount of literature, additional studies are needed. Also, studies regarding students of color and their relationships with peers participating in the faculty research programs would be recommended.

### **Longitudinal studies**

Studies that examine the cohort experience of undergraduate transfer students of color, and a longitudinal study of a cohort who has participated in a faculty research program would be recommended. These longitudinal studies would include a pre and

post assessment tool of a cohort who would be participating in a STEM faculty research program for two to three years to ascertain the full picture of their lived experiences.

### **Support for continued national funding**

Continued studies into relationships between faculty and students of color are needed to support the need to continue the valuable government and private funding. Qualitative studies allow researchers to hear the voices of this population and their voices are needed to be heard in order to drive the funding to support their unique needs, to assist in retention, and completion in STEM research programs. Additionally, expanding funding can also focus on individual STEM disciplines and gender disparity issues within these disciplines.

### **Professional development for faculty**

During the informal conversations with faculty, a reoccurring theme emerged. Faculty consistently stated that they felt inadequate in the preparation for mentoring students of color in emotional and social issues. The faculty was extremely prepared within their respective disciplines, carried out nationally acclaimed research in their fields, and included their students of color in the research. However, they had little or no professional development in mentoring students. Through these conversations, I would recommend a scheduled professional development at the start of each semester to address these faculty concerns. Also gaining professional development in this area would also assist the students of color in facing the challenges in transfer and their subsequent adjustment to life at a four-year university. Further, I would also recommend that a member of the university's counseling staff address the STEM faculty for "warning" signs in students in regards to depression, stress, and withdraw symptoms. There are also

mentoring societies that have systematic programs in which a faculty and staff can participate in. Individual faculty can be trained and then become trainers themselves.

In conclusion, this study showed the lived experiences and the student-faculty interactions of transfer students of color as they participated in a faculty research program. Students expressed that their relationships and interaction with faculty assisted in their retention and persistence in their STEM disciplines and academics. Additionally, their engagement with faculty research would advance their career aspirations.

## REFERENCES

- American College Testing. *National Data Release*. Iowa City, IA: ACT 2004.
- Association for the Study of Higher Education. (2003). *Higher Education Report*. Las Vegas, NV: ASHE Publishers.
- Astin, A. W. (1984). Student involvement: A developmental theory of higher education. *Journal of college student personnel*, (25),297-308.
- Astin, A.W. (1993). *What matters in college? Four critical years revisited*. San Francisco, CA: Jossey-Bass Publishers.
- Bavarian, B. (2013, May). Manufacturing Engineering Systems and Management Projects, Summer Projects. *AIMS<sup>2</sup> Project Social*.
- Beal, P. E. and Noel, L. (1979). *What works in student retention*. (A report of the American College Testing Program and the National Center for Higher Education Management Systems). Iowa City: IA: American College Testing Program.
- Bloomberg, L. D. and Volpe, M. (2008). *Completing your qualitative dissertation: A Roadmap from beginning to end*. Thousand Oaks, CA: Sage Publications
- Bloomberg, L. D. and Volpe, M. (2012). *Completing your qualitative dissertation: A roadmap from beginning to end*. Thousand Oaks, CA: Sage Publications
- Cejda, B. D., and Kaylor, A. J. (1997). Academic performance of community college Transfer students at private and liberal arts colleges. *Community College Journal of Research Practice*,(21), 651–659.
- Chickering, B. (1969). *Education and identity*. San Francisco: Josey-Bass.
- Chickering, A.W. & Ehrmann, S.C. (1996). Implementing the Seven Principles: Technology as Lever. *American Association for Higher Education Bulletin*, 49(2), 3-6. Retrieved online 1 July, 2009 from <http://www.aahea.org/bulletins/articles/sevenprinciples.htm>

- Chickering, A. W. and Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *American Association of Higher Education Bulletin*, 39(7),3-7.
- Clark, C. C. and Arboleda, T. (1999). *Teacher's Guide for in the Shadow of Race: Growing Up As a Multiethnic, Multicultural, and "Multiracial" American*. New York, NY: Routledge Press, p. 17.
- College Portraits. (2013). College Portrait Link. California State University Northridge. Retrieved from <http://www.collegeportraits.org>.
- Cotton, S.R., and Wilson, B. (2006). Student-Faculty interactions: Dynamics and determinants. *Higher Education*, 51(4), 487-519.
- Cox, B.E., and Orehovec, E. (2007). Faculty-Student interaction outside the classroom: A typology from a residential college. *Review of Higher Education*, 30(4). 343-362.
- Daily, S. B., Eugene, W., and Prewitt, A. D. (2007). The development of social capital in engineering education to improve student retention. *American Society for Engineering Education*. Presented at the Southeastern Section Conference.
- Definitions.net. (n.d.). *People of color*. Retrieved July 2, 2014, from [http://www.definitions.net/definition/people of color](http://www.definitions.net/definition/people%20of%20color).
- Dougherty, K. J. (1992). Community college and baccalaureate attainment. *Journal of Higher Education*, (63), 188–214.
- Durdella, N. (2012). *Notes from a lecture on an Introduction to ATLAS.ti*. Methodology Chapter ELPS 785, California State University, Northridge, Northridge, CA.
- Eggleston, L., & Laanan, F. (2001). Making the transition to the senior institution. [Electronic version]. *New Directions for Community Colleges*, (114), 87–97.

- Einarson, M.K., and Clarkberg, M.E. (2004). *Understanding faculty out-of class Interaction with undergraduate students at a research university*. Paper presented at the Association for the Study of Higher Education.
- Glesne, C. (2011). *Becoming qualitative researchers*. San Francisco, CA: Pearson Publishers.
- Hammersley, M., and Atkinson, P. (1983). *Ethnography: Principles in practice*. London: Routledge.
- Hathaway, R.S., Nagda, B.A., and Gregerman, S.R. (2002). The relationship of Undergraduate research participation to graduate and professional education pursuit: an empirical study. *Journal of College Student Development*, 43, 614-631.
- Hendley, V. (1997). Recruiters hear a “me too!” from community college students [Electronic version]. *ASEE Prism*, 6, 20–26.
- Hurtado, S., Han, J. C., Sáenz, V. B., Espinosa, L. L., Cabrera, N, and Cerna, O. S. (2007). Predicting transition and adjustment to college: Biomedical and behavioral science aspirants’ and minority students’ first year of college. *Research in Higher Education*, (48)7. 841-887.
- Jackson, S. A. 2003. *The Quiet Crisis: Falling short in producing American scientific and technical talent*. Baltimore: Johns Hopkins University Press.
- Keener, B. J. (1994). Capturing the community college market. *Currents*, 20(5), 38–43.
- Kerr, T. J.; King, M. C.; and Grites, T. J. (Eds.). (2004). *Advising transfer students: Issues and Strategies*. NACADE Monograph Series No. 12. Manhattan, KS: NACADA.
- Kezar, A., and Eckel, P. (2007). Learning to ensure the success of students of

- color: A systematic approach to effective change. *Change: The Magazine of Higher Learning*, 39, 4.
- Kim, Y. K., and Sax, L. J. (2007). Different patterns of student-faculty interaction in Research universities: An analysis by student gender, race, sex, and first generation status. Berkeley, CA: Center for Studies in Higher Education, University of California, Berkeley
- Kim, Y. K., and Sax, L. J. (2009). Student-faculty interaction in research universities: Differences by student gender, race, income, and first-generation status. *Research in Higher Education*, 50(4), 437-459.
- Knoell, D. M., & Medsker, L. L. (1965). *From junior to senior college: A national study of the transfer student*. Washington, D.C.: American Council of Education.
- Kuh, G. D., Kinzie, J., Schuh, J. H., and Whitt, E. J. (2005). *Student Success in College: creating conditions that matter*. San Francisco, CA: Jossey-Bass.
- Kuh, G.D., and Hu, S. (2001). The effects of student-faculty interactions in the 1990s. *Review of Higher Education*, 24(3), 309-332.
- Lampert, M.A. (1993). Student-faculty informal interaction and the effect on college Student outcomes: A review of the literature. *Adolescence*, 28(112), 971-990.
- Leggon, C. B. and S. Malcom. 1994. "Human Resource Issues in Science and Engineering: Policy implications." In Willie Pearson, Jr. and Alan Fechter, Editors. Who will do science: educating the next generation.
- Leininger, M. M. (1985). Ethnography and ethnonursing: Models and modes of qualitative data analysis. In M. M. Leininger (Ed.), *Qualitative research methods in nursing* (pp. 33-72). Orlando, FL: Grune & Stratton

- Longerbeam, S.D., Sedlacek, W. I., and Alatorre, H. M. (2004). In their own voices: Latin student retention. *National Association of the Student Personnel Administrators Journal*, 41(3), 538-550.
- Lopatto, D. (2003). The essential features of undergraduate research. *Council on Undergraduate Research Quarterly*, 23(2).139-142.
- McClenney, K. M., and Marti, C. N. *Exploring relationships between student engagement and student outcomes in community college: Report on validation research*. Austin, TX: Community College Survey of Student Engagement. Retrieved August 22, 2013.
- McCormick, A. C. and Carroll, C. D. (1997). "Transfer behavior among beginning post-secondary students: 1989-1994." Washington D.C.: U.S. Department of Education, Center for Education Statistics.
- Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass.
- Miles, M. and Huberman, A.M. (1994). *Qualitative data analysis: An expanded sourcebook*. (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage Publications.
- Mook, L. (2002). *Current Issues in Comparative Education, Teachers College, Columbia University*, April 30. 154-169.
- Museus, S. D., and Liverman, D. (2010). Analyzing high-performing institutions: Implications for studying minority students in STEM. In S. R. Harper, C. Newman, and S. Gary (EDS.), *Students of color in STEM: Constructing a new research agenda*. New Directions for Institutional Research (No. 148, 17-27). San Francisco, CA: Jossey-Bass.

- National Science Foundation. (2007). *Monitoring progress towards success of K-12 STEM education*. Retrieved from <http://www.nsf.gov/news>.
- Pace C. R. (1980). Measuring the quality of student effort. In *Improving Teaching and Institutional Quality, Current Issues in Higher Education*, No. 1. Washington, D.C.: American Association for Higher Education.
- Pace, C. R. (1984). *Measuring the quality of college student experiences*. Los Angeles: University of California, The Center for the study of Evaluation, Graduate School of Education.
- Parsad, B., and Lewis, L. (2003). *Remedial education at degree-granting postsecondary institutions in fall 2000*. Washington, D.C.: U.S. Department of Education, National Center of Educational Statistics.
- Pascarella, E. (1985). College environment influences on learning and cognitive development: A critical review and synthesis. In J. Smart (Ed.), *Higher Education: Handbook of theory and research* (Vol.1). New York, NY: Agathon.
- Pascarella, E., and Terenzini, P. (1991). *How college affects students*. San Francisco, CA: Jossey-Bass Publishers.
- Pascarella, E., and Terenzini, P. (1998). Studying college students in the 21<sup>st</sup> century: Meeting new challenges. *Review of Higher Education*, 21(2), 151-165.
- Pascarella, E. (1984). College environmental influences on students' educational aspirations. *The Journal of Higher Education*, 55(6), 751-771.
- Pascarella, E., and Terenzini, P. (2005). *How college affects students* (Vol. 2): *A third decade of research*. San Francisco, CA: Jossey-Bass Publishers.

- Phillippe, K., & Patton, M. (1999). *National profile of community colleges: Trends and Statistics* (3rd ed.). Washington, D.C.: Community College Press, American Association of Community Colleges.
- Pincus, F., & Archer, E. (1989). *Bridges to opportunity: Are community colleges meeting The transfer needs of minority students?* New York: Academy for Educational Development and College Entrance Examination Board.
- Rendón, L. I. (1994). Validating cultural diverse students: Toward a new model of learning and student development. *Innovative Higher Education, 19*(1), 33-50.
- Rendón, L. I. (1999). Toward a new vision of the multicultural community college for the next century. In *Community Colleges as Cultural Texts: Quarterly Exploration of organizational and Student Culture*, edited by K. M. Shaw, J. R. Valadez, and R. A. Rhoads, 195-204. Albany, NY: State University of New York Press.
- Rendón, L. I., Jalomo, R. E., & Nora, A. (2000). Theoretical considerations in the study of minority student retention. In Braxton, J. (Ed.), *Rethinking the student departure puzzle: New theory and research on college student retention*. Nashville, TN: Vanderbilt University Press.
- Rendón, L. I. (2002). The Puente Project: A validating model of education. *Educational Policy, 16*(4), 642-667.
- Rendón, L. I. (2006). *Facilitating student success. Transforming teaching and learning*. Keynote presentation at Pennsylvania State University.
- Rendón, L. I. (2009). *Sentipensante (Sensing/Thinking) pedagogy. Educating for Wholeness, Social Justice and Liberation*. Sterling, VA: Stylus Press.

- Rendón, L. I., and Burgis, L. (2006). Learning with the heart and mind: Embracing Wholeness in learning communities. In P. Laurence, and J.L., Subbiondo (Eds.)
- Rivera, E. I. (2010). *Community college transfer in baccalaureate engineering degree programs*. White Plains, NY: National Action Council for Minorities in Engineering.
- Rosenbaum, J. E., Deil-Amen, R., and Person, A. E. (2006). *After Admission: From College access to college success*. New York: Russell Sage. DOI: 10.1177/0091552108327071
- Rossman, G. B. and Rallis, S. F. (2003). *Learning in the field: An introduction to qualitative research* (2<sup>nd</sup> ed). Thousand Oaks, CA: Sage Publications.
- Rossman, G. B. and Rallis, S. F. (2012). *Learning in the Field: An introduction to qualitative research* (3<sup>rd</sup> ed). Thousand Oaks, CA: Sage Publications.
- Schram, T.H. (2006). *Conceptualizing qualitative inquiry: Mindwork for fieldwork in education and the social sciences*. Upper Saddle River, NJ: Merrill Prentice Hall.
- Scott, A. L., and Martin, A. (2012). *Dissecting the data 2012: Examining STEM opportunities and outcomes for underrepresented students in California*  
Retrieved from Level Playing Field Institute website: <http://www.lpfi.org>
- Seidman, I. (2006). *Interviewing as qualitative research: A guide for researchers in education and the social sciences* (3<sup>rd</sup> ed.). New York, NY: Teachers College Prep.
- Simon, M., and Goes, J. (2012). *Dissertation and Scholarly Research: Recipes for Success*. Seattle, WA: Dissertation Success, LLC.

- Spradley, J.P. (1980). *Participant observation*. San Francisco, CA: Holt, Rinehart and Winston.
- Spradley, J.P. (1979). *The ethnographic interview*. San Francisco, CA: Holt, Rinehart & Winston.
- Taylor, S. J., & Bogdan, R. (1984). *Introduction to qualitative research methods: The search for meanings*. New York: John Wiley & Sons.
- Terenzini, P. T. (1986). Retention research: Academic and social fit. Paper presented at The annual meeting of the Southern Regional Office of the College Entrance Examination Board, New Orleans.
- Thompson, M. D. (2001). Informal student-faculty interaction: Its relationship to educational gains in science and mathematics among community college students. *Community College Review*, 29(1): 35-57.
- Townsend, B. K. (1995). Community college transfer students: A case study of survival. *The Review of Higher Education*, 18(2): 175-193.
- Townsend, B. K. and Wilson, K. B. (2006). "A hand to hold for a little bit." Factors facilitating success of community college transfer students to a larger research university. *Journal of College Student Development* 47(4), p. 439-456.
- U. S Department of Education, 2013-HSI website HSI STEM and Articulation Programs (HEA, Title III, Part F, Section 371; CFDA# 84.031C).
- U.S. Department of Education. National Center for Education Statistics. *Low-income students: Who they are and how they pay for their education*. NCES 2000-169, Washington, D.C.:2000

- Velez, W. (1985). Finishing college: The effects of college type. *Sociology of Education*, 58, 191–200.
- Volkwein, J. F., King, M.C., and Terenzini, P. T. (1986). Student-faculty relationships and intellectual growth among transfer students. *The Journal of Higher Education*, (57)4, p. 413-430.
- Wiersma, W. (2000). *Research Methods in Education: An Introduction*. Boston, MA: Allyn and Bacon.
- Wynn, A. R. (2002). Cracking the code: What transfer students really need to be successful at four-year institutions. Retrieved from <http://www.dus.psu.edu/mentor>.

**APPENDIX: A – EMAIL INVITATION TO PARTICIPATE IN  
RESEARCH STUDY**

The Experiences of Transfer Students of Color Participating in Research Programs: an  
Examination of Student-Faculty Interaction in STEM Research Projects

*Student Participants*

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Greetings!

I am currently scheduling interviews regarding your participation in the [name of program]. As per your contract and waiver, your participation in the interviews is required.

I will be conducting interviews [dates of interview] in Room [room number] in the [name of college]. The times of the interviews begin at 10am and end at 3pm. Each interview should last approximately 1 hour.

Please reply to this email as to your availability on one of the above dates and please specify two options for a time desired.

Thank you for your assistance and cooperation.

Donna Randolph  
Doctoral Candidate  
Research Assistant

## **APPENDIX: B – STRUCTURED INTERVIEW PROTOCOL**

### **The Experiences of Transfer Students of Color Participating in Research Programs: an Examination of Student-Faculty Interactions in STEM Research Projects**

#### ***Student Participants***

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#### **I. Pre-interview Session: Introduction/Background**

##### **Welcome and introduction:**

*Good morning/afternoon/evening. Thank you for taking the time to talk with me today.*

##### **Purpose of the second interview:**

*As we discussed, this interview is part two of the interview series intended to collect information for a research study that examines success of students in engineering and computer science fields. During the interview, we will talk about your experiences as a student in the Research Project.*

##### **Confidentiality:**

*To remind you, any information you share with me today will be used for research purposes only. I will be aggregating results from all interviews and will not be attributing comments to any particular person. You will not be identified by name, department or office, position, or any other personally identifying information in any report or document. Today's interview session will be audio-recorded. I will also be taking notes of the conversation. The audio recordings may be transcribed for analysis. The audio recorded file will be maintained and stored securely until transcribed, after which it will be destroyed. In addition, the transcribed interview data files, member check data files, and interview notes will be stored securely in a password-protected laptop of the researcher until completion of study. Upon completion of study, the files and notes will be destroyed after a period of ten years. Only the researchers identified in the informed consent form will have access to the files and notes. The files and notes will be accessed and analyzed in strict confidentiality. Finally your name or personally identifying information will not be used in any published or public reports.*

##### **Informed consent:**

*As you know, this consent notice summarizes some information from the Consent to Participate in Research and communicates the procedures, potential risks and discomforts for subjects, potential benefits to subjects, payment to subjects for participation, participation and withdrawal, and rights of research subjects. Procedures in this interview are limited to semi-structured personal interview sessions. Because the study deals with issues that are sensitive, some interview questions may involve issues of a personal nature. You may feel uneasy about answering some of these interview questions. You may elect not to answer any of the questions with which you feel uneasy and still remain as a participant in the study. You may not benefit personally from your participation in this study. However, findings from this study may lead to improvements in support programs for students and may contribute to our knowledge on the subject.*

*Your participation in this interview is voluntary. You are not obligated whatsoever to answer or respond to any question or to discuss anything that you are not inclined to answer or discuss. You can skip any question, or any part of any question, and will not face any penalty for answering, or not answering, any question in any way. You may ask that the audio recording be stopped at any time and/or may leave the interview at any time for any reason without consequences of any kind. You may withdraw consent at any time and discontinue participation without interview. You can halt your participation in the interview at any time. You are not waiving legal claims, rights, or remedies because of your participation in this interview.*

**Timing:**

*Today's interview will last approximately 60 minutes. Are there any questions before I get started?*

**II. Interview Session**

***Demographic and Background Questions***

1. Describe how you identify in terms of gender and ethnicity.
2. Describe your family background and upbringing.
  - a. Do you live at home with your parents?
  - b. Did your parents go to college?
  - c. Did/do you have siblings in college?
  - d. Do your high school friends go to college?
  - e. How do you feel that your high school experiences prepared you for college?
  - f. How does your home/family life support or not support your academic studies?
3. Describe your activities outside of class.
  - a. Do you work on/off campus?
  - b. Do you care for siblings?
  - c. Do you socialize with friends? If so, how frequently?
  - d. Do you feel that you face obstacles or barriers to your academic studies from your responsibilities off campus (e.g., at home, with work, etc.)? If so, how do you overcome these obstacles/barriers?

4. Describe how you identify as a student at this university.
  - a. Do you participate in campus activities? Please describe the activities.
  - b. How much time do you spend on campus outside of class?
  - c. Are you working on campus? If so, describe your position.
  - d. Do you socialize with students on campus? Please describe your activities on campus.
  - e. Do you eat with students on campus? What meals...breakfast, lunch or dinner?
  - f. Do you attend university athletic events? If so, which events?

#### *Transfer Experiences*

5. Describe your experiences transferring from the community college or other university.
  - a. Describe your experiences with faculty before coming to this university. How frequently did you interact with faculty? Describe one interaction with faculty before coming to this university.
  - b. Describe your experiences with peers before coming to this university. How did you interact with fellow students? Share an example of an interaction with students in your previous college.
  - c. Describe your experiences with participating in research with faculty before coming to this university. Did you participate in faculty research before ?

#### *Academic Experiences and Participation*

6. Describe your academic experiences since being at this university.
  - a. Describe your experience in the classroom since being at this university.
  - b. Describe your experiences as an engineering or computer science major since being at the university.
7. Name an engineering or computer science class that you're currently taking or completed in the most recent semester. Describe your experiences in the class and how you performed academically.

## ***Student-Faculty Interaction<sup>1</sup>***

### *Inside the Classroom (In-Class)*

8. Describe a recent interaction in-class and inside the classroom with a faculty member in engineering or computer science. Describe the steps and details of the interaction from beginning to end.
9. Describe a recent interaction in-class and inside the classroom with your faculty mentor. Describe the steps and details of the interaction from beginning to end.

### *Inside the classroom (Out-of-class)*

10. Describe a recent interaction out-side of class but in the classroom with your faculty mentor. Describe the steps and details of the interaction from beginning to end.

### *Inside a Supplemental Lab and Research Lab (Out of Class)*

11. Describe a recent interaction inside the lab with your faculty mentor. Describe the steps and details of the interaction from beginning to end.

### *In the Instructor's Office (Out-of-class)*

12. Describe a recent interaction in your faculty mentor's office. Describe the steps and details of the interaction from beginning to end.

### *Online-Email, Moodle, and Skype (Out-of-Class)*

13. Describe a recent interaction with your faculty mentor using electronic modalities. Describe the steps and details of the interaction from beginning to end.

### *On-Campus-Clubs and Organizations (Out-of-Class)*

14. Describe a recent interaction with your faculty mentor in a club or organization. Describe the steps and details of the interaction from beginning to end.

### *Off-Campus-Professional Association Meetings, Research Competitions (Out-of-Class)*

15. Describe a recent interaction with a faculty member during an off campus activity. Describe the steps and details of the interaction from beginning to end.
  - a. Where did the interaction occur? In the local area, another city?

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<sup>1</sup> Follow-up questions: Where did the interaction occur? Who initiated the interaction? Why did you interact with this professor/mentor/cohort participant? What happened during the interaction? How did the interaction end? Would you have changed anything in the interaction? How did this interaction change you?

- b. When did the interaction occur? On a weekend, weekday? What part of the semester?
16. Overall, describe how your interactions with your faculty mentor have changed since being in the project. Give details and examples in your response.
17. Overall, describe the quality of your interaction with your faculty mentor.

### ***Peer-Peer Interaction<sup>2</sup>***

#### *Inside the Classroom (In-class)*

18. Describe a recent interaction in-class and inside the classroom with cohort participants. Give the steps and details of the interaction from beginning to end.
- a. When did the interaction occur?

#### *Inside the classroom (Out-of-class)*

19. Describe a recent interaction out of class but inside the classroom with your cohort participants. Describe and give details of the interaction from beginning to end.

#### *Inside a Supplemental Lab and Research Lab (Out-of class)*

20. Describe a recent interaction inside a lab, supplemental lab or research project activity with your cohort participants. Describe the steps and details from beginning to end.
- a. When did the interaction occur? What part of the semester? Summer?

#### *Online-Email, Moodle, and Skype (Out-of-Class)*

21. Describe a recent interaction with your cohort participants using electronic modalities. Describe the steps and details of the interaction from beginning to end.
- a. How did the interaction occur? Email? Moodle? Skype, other?
  - b. When did the interaction occur? On a computer ? A mobile device? At home? In the dorm?

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<sup>2</sup> Follow-up questions: Where did the interaction occur? Who initiated the interaction? Why did you interact with this professor/mentor/cohort participant? What happened during the interaction? How did the interaction end? Would you have changed anything in the interaction? How did this interaction change you?

- c. When did this interaction occur? Right after class? In the evening? In the evening? Time in the semester?

*On-Campus-Club and Organizations (Out-of-Class)*

- 22. Describe a recent interaction in a club or organization with your cohort participant. Describe the steps and details of the interaction from beginning to end.
  - a. What club or organization did the interaction occur with?
  - b. When did the interaction occur? Time of day? Time in the semester? During a regular meeting?

*Off-Campus-Professional Association Meetings, Research Competitions (Out-of-Class)*

- 23. Describe a recent interaction with your cohort participants during an off-campus professional association meeting, research competition, etc. Describe the steps and details of the interaction from beginning to end.
  - a. What type of event(s) did this interaction occur?
  - b. When did the interaction occur? During the weekday? Weekend? Time in semester?
- 24. Overall, describe how your interactions with your cohort participants have changed since being in the research program. Give details and examples in your response.
- 25. Overall, describe the quality of your interaction with the cohort participants.

*Peer Tutoring/Mentoring*

- 26. Describe your experiences with peer mentors. Describe some interactions that you've had and your feelings about them.
- 27. Describe your experiences with peer tutors. Describe some interactions that you've had and your feelings about them.

*Research Participation*

- 28. Talk about your experiences participating in research projects with your faculty mentor in the program.
  - a. Describe an interaction.

- b. What have done for the research activity?
- c. How has participating in the research activity/project changed you?
- d. How does participation in these projects prepare you academically for classes and your career?

#### *Academic Advising*

- 29. Describe your experiences with academic advising in engineering and computer science. Have your experiences changed since joining the research program?

#### *Career Preparation*

- 30. Discuss your preparation for a career in engineering or computer science. Describe your experiences at the university and how your experiences have changed after joining the program.
- 31. Are you aware that the research program students are forming a club on campus? If so, describe any involvement or knowledge you have regarding the club.

#### *Peer Interactions with Community College Students*

- 32. Describe your experiences with local Community College students.

#### **Closing Questions**

*I would like give you a final opportunity to help us examine these issues. Before I end today, is there anything that I missed? Do you have anything else to add at this time? Have you said everything that you wanted to say but didn't get a chance to say? Have you shared everything that is significant about these interactions with me? If there's anything else that you recall after our interview session, I invite you to share it by contacting me.*

#### **III. Post-Interview Session: Debriefing, Member Checking, and Closing**

*Thank you for participating in today's interview session. I appreciate your taking the time and sharing your ideas with me. I also want to restate that what you have shared with me is confidential. No part of our discussion that includes names or other identifying information will be used in any report or document. Before we end today's interview, I'd like to ask you to participate in a process that we call "member checking," where you receive an electronic copy of the transcribed or written interview from today. If we send you a copy of the interview, we may ask you to review and share comments, if you have any, and then send the comments to us. May I send you a copy of the interview when ready? Finally, I want to provide you with a chance to ask any questions that you might have about this interview. Do you have any questions at this time?*

## APPENDIX C: DESCRIPTIVE OBSERVATION GUIDE

### The Experiences of Transfer Students of Color Participating in Research Programs: an Examination of Student-Faculty Interactions in STEM Research Projects

<i>Space</i>	<i>Space</i>	<i>Object</i>	<i>Activity</i>	<i>Event</i>	<i>Time</i>	<i>Actor</i>	<i>Goal</i>	<i>Feeling</i>
	<b>Can you describe the places where faculty and students interact?</b>	How do objects used during project activities organize places?	How do project activities affect the places where they occur?	How do events re/organize places where activities occur?	What changes to the project places occur over time?	How do faculty and students use places for project activities?	How do project goals relate to places where activities occur?	What project places are associated with more frequent and intense feelings?
<i>Object</i>	Where do you find the objects that faculty and students use?	<b>Can you describe what faculty and students use to interact?</b>	How are objects used in project activities?	How are objects used in project events?	How do faculty and students use objects over time?	How do faculty and students use objects to interact?	How are objects used to support project goals?	How do objects used by faculty and students evoke feelings?
<i>Activity</i>	Where do project activities take place?	How do project activities incorporate objects?	<b>Can you describe what faculty and students do?</b>	How are project activities and events related?	How do project activities vary by time of day and week of semester?	What are the ways that project activities include faculty/students?	How do project activities involve project goals and objectives?	How do project activities elicit feelings from faculty/students?
<i>Event</i>	Where do project events occur?	How do project events incorporate objects that faculty and students use to interact?	How do project events relate to what faculty and students do in the project?	<b>Can you describe what events faculty and students participate in?</b>	How do project events occur over time? Is there a sequence to project events?	How do faculty and staff participate in project events?	How do project events relate to project goals and activities?	How do events shape feelings of faculty and students?
<i>Time</i>	How does time affect where project activities and events occur?	How does time of day, week, month, and semester affect objects used?	When do most project activities occur?	When do most project events occur?	<b>Can you describe when projects activities and events occur?</b>	How do faculty and students act when together?	When is most progress on project goals and objectives achieved?	When are feelings the most intense and frequent during the project?
<i>Actor</i>	Where do faculty and students place themselves during activities?	How do faculty and student use objects?	What do faculty and students do as part of the project?	How are students and faculty involved in project events?	How do faculty and students change over time?	<b>Who participates in project activities and events?</b>	How are faculty and students connected to project objectives?	What do faculty and students feel as a result of project interaction?
<i>Goal</i>	Where are project goals achieved?	How do objects used in the project support project goals and objectives?	How do project activities support project goals and objectives?	How are project events related to project goals and objectives?	How do project goals and objectives change over time?	How do project goals and objectives affect faculty and students?	<b>Can you describe the goals of project activities and events?</b>	How do project goals and objectives elicit feelings of students/faculty?
<i>Feeling</i>	Where do faculty/students feel the most about the activities?	How do faculty and student feelings relate to the use of objects?	How do student and faculty feelings affect project activities?	How do student and faculty feelings affect project events?	How does time affect student and faculty feelings about the project?	How do feelings influence students and faculty?	How do feelings influence project goals and objectives?	<b>Can you describe how faculty and students feel during interaction?</b>

## APPENDIX D: CODE-CODE FAMILIES-CULTURAL THEME TABLE

### The Experiences of Transfer Students of Color Participating in Research Programs: an Examination of Student-Faculty Interactions in STEM Research Projects

<b><i>Theme 1:</i></b>	<b><i>Link to Interview Protocol Questions</i></b>	<b><i>Descriptive Words</i></b>	<b><i>Activity</i></b>	<b><i>Event</i></b>	<b><i>Time</i></b>	<b><i>Actor</i></b>	<b><i>Goal</i></b>	<b><i>Feeling</i></b>
<b><i>Communication Descriptions</i></b>	<b>Can you describe how you communicated with faculty?</b>	Emails, meetings in office, weekly, on Fridays, cohort orientation, in the hallways	Emails, office visits, supplemental labs, research projects, Tech Fest, summer research	Helped me choose classes, just to talk, discuss personal issues, discuss internships, discuss summer research	Weekly, Friday workshops, at the end of the semester, whenever I had an issue, when I had problems	Students of Color Faculty Mentors	Exposing the methods of communicating between faculty and students of color	Made me feel good, helped me with time management, friendly, serious with me, liked hearing about stuff
<b><i>Theme 2: Student-Faculty Relationships in Research and Research Workshops</i></b>	<b>Talk about your experiences participating in research projects and the weekly workshops.</b>	I set up the PowerPoint, helps each group, connect to outside world, did some real research, offered job opportunities	Weekly workshops, and Research-related activities	Cohort orientations, workshops, research projects	Weekly workshops, summer research, and semester research	Students of Color Faculty Mentors	How are the students of color exposed to research and what are the goals of the weekly workshops	Wish we had more research in the weekly workshops, connect to classroom learning, developed relationships with faculty
<b><i>Theme 3: Faculty Commitment and Caring</i></b>	<b>Describe a recent interaction with a faculty mentor.</b>	Mentors seemed involved in research, Mentors take this program seriously, I know how to study better	Face-to-face meetings, emails	Cohort orientations, weekly workshops	At the beginning of each cohort, end of semester meetings, requested face-to face meetings	Students of Color Faculty Mentors Program staff	Descriptions of student feelings of interactions both inside and outside the classroom	Felt comfortable, I was excited, gave me great advice, told me research is important to my future, listened to my personal issues
<b><i>Theme 4: Research Culture and Student-Faculty Relationships</i></b>	<b>Talk about your experiences participating in research projects with faculty mentors.</b>	Good experiences, Got more information on major, experience with grad students and peer volunteers	Conference participation, Tech Fest, cohort orientations	Face-to-face meetings, weekly workshops, clubs and organizations on campus	Weekly meetings, scheduled campus events, national conferences, research projects during semester and summer	Students of Color Faculty Mentors Program Staff Industry Partners Research staff outside of University	Descriptions of how research culture is linked to student-faculty relationships	He plays favorites, learned about lab equipment, helped me in classwork,

<b><i>Time 5: Student-Faculty Interaction and Academics</i></b>	<b>Describe experiences with Academic Advising</b>	Helped me with picking classes, helped learn how to study	Weekly meetings, office visits	Tutoring, workshops	Weekly meetings End of semester advising	Students of Color Faculty Mentors Recommended peer tutors	Interactions linked to academic enhancement	Really helpful, Very positive, Spends time with me
<b><i>Theme 6: Helping Students of Color Face Transition Challenges</i></b>	<b>Describe your experiences transferring from a Community College or other university</b>	Learned time management, improved my study habits for university courses, faculty mentor helped me to learn university thing	Face-to-face mtgs, weekly workshops	Class selection Academic Advising mtgs	Throughout semester	Students of Color Faculty Mentors	Challenges and experiences linked to transfer	Professors were friendly, feel like I am getting in the flow,