

2017

## **Challenging and Supportive Factors Encountered by Underrepresented Minority Doctoral Students in Science, Technology, Engineering, and Mathematics**

Tessy Tatiana Pumacchua  
*University of Rhode Island*, [pumacchuat@gmail.com](mailto:pumacchuat@gmail.com)

Follow this and additional works at: [https://digitalcommons.uri.edu/oa\\_diss](https://digitalcommons.uri.edu/oa_diss)

---

### **Recommended Citation**

Pumacchua, Tessy Tatiana, "Challenging and Supportive Factors Encountered by Underrepresented Minority Doctoral Students in Science, Technology, Engineering, and Mathematics" (2017). *Open Access Dissertations*. Paper 674.  
[https://digitalcommons.uri.edu/oa\\_diss/674](https://digitalcommons.uri.edu/oa_diss/674)

This Dissertation is brought to you for free and open access by DigitalCommons@URI. It has been accepted for inclusion in Open Access Dissertations by an authorized administrator of DigitalCommons@URI. For more information, please contact [digitalcommons-group@uri.edu](mailto:digitalcommons-group@uri.edu).

CHALLENGING AND SUPPORTIVE FACTORS ENCOUNTERED BY  
UNDERREPRESENTED MINORITY DOCTORAL STUDENTS IN SCIENCE,  
TECHNOLOGY, ENGINEERING, AND MATHEMATICS

BY

TESSY TATIANA PUMACCAHUA

A DISSERTATION SUBMITTED IN PARTIAL FULLFILLMENT OF THE  
REQUIREMENT FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN

PSYCHOLOGY

UNIVERSITY OF RHODE ISLAND

2017

DOCTOR OF PHILOSOPHY DISSERTATION  
OF  
TESSY TATIANA PUMACCAHUA

APPROVED:

Dissertation Committee:

Major Professor

Margaret Rogers

Nichea Spillane

Lynne Derbyshire

Nasser H. Zawia

DEAN OF THE GRADUATE SCHOOL

UNIVERSITY OF RHODE ISLAND

2017

## **ABSTRACT**

The purpose of the present study was to examine the supportive and challenging factors underrepresented minority students encounter in an academic setting as they obtain doctoral degrees in STEM disciplines. The study also explored the impact of students' multiple social identities on their educational experiences, as well as the recommendations these students would provide to incoming doctoral students of color in STEM. Participants in this study consisted of 12 self-identified students from underrepresented minority backgrounds enrolled in STEM doctoral degree programs at predominately White institutions in the U.S.. Qualitative methods were utilized in this study. Specifically, the data was obtained through semi-structured interviews and was analyzed using manifest content analysis.

The results revealed that underrepresented minority doctoral students in STEM viewed the support received from faculty, mentors, advisors, and program directors as the main factors that have contributed to their doctoral academic success. Conversely, commonly identified challenges included having an advisor who was negligent or unsupportive, as well as adjusting to being a student at a predominately White institution and the difficulties associated with that. In terms of the impact of intersectionality on students' doctoral educational experiences, participants reported both benefits and challenges associated with their various social identities. Specifically, half of participants reported that their multiple social identities aided their academic achievement and served as a source of motivation and empowerment. However, a number of participants also reported that their various social identities has made it difficult to relate to others, caused them to feel isolated, and/or created

challenges in navigating friendships. Lastly, in providing recommendations for underrepresented minority students who are beginning doctoral programs in STEM, the majority of participants suggested that incoming students find a support system within or outside their academic program.

## ACKNOWLEDGEMENTS

There are so many people I would like to thank, because without the help of various mentors, faculty, friends, and family, I would not be where I am today. First, I would like to extend a very special thank you to my major professor, Dr. Margaret Rogers. Not only has Dr. Rogers guided me in my doctoral research and professional development throughout the past four years, but she also has challenged me and encouraged me to pursue anything I set my mind to. Dr. Rogers, thank you so much for believing in me and for helping me recognize my strengths, as well as supporting me through my areas of growth. I am so appreciative to have had a dedicated mentor like you. Not only do I feel ready to embark on the next professional chapter of my life as a result of your mentorship, but you also provided me with a sense of connectedness and support at URI. Your genuine interest in my success not only as a student, but also as a person, did not go unnoticed. Thank you so much for everything you did and everything you continue to do.

A special thank you also goes to my doctoral committee members, Dr. Lynne Derbyshire, Dr. Nichea Spillane, as well as my defense chair Dr. Kristin Johnson. Thank you all for your guidance, feedback, and support, not only through my dissertation, but also during my comprehensive exams. I feel very lucky to have had the opportunity to work with a group of such intelligent, accomplished, and inspiring women!

I would also like to thank the various mentors, faculty, and programs that have supported me since my undergraduate years. Words cannot express how thankful I am to Dr. James C. Kaufman, who took me under his wing as a young sophomore in

college. Dr. Kaufman, thank you for believing in my potential and showing me how cool research can be. You were the first educator who told me I could go far in school and in many ways, because of the experiences you provided me and how much support you gave me, I am here today. I would also like to thank my master's advisor, Dr. Eugene Wong, who was always so supportive, resourceful, and helped me find my passion within school psychology, as well as teaching! I would also like to thank Dr. Sanders McDougall, Dr. Cynthia Crawford, Dr. Kelly Campbell, as well as the CSUSB Minority Access to Research Careers and the Ronald E. McNair Scholars Program. The support I received from these faculty and programs while at CSUSB made a world of difference to me.

Lastly, I would like to thank my family and friends for their continuous support. Within this group, I would like to highlight the contributions of two key people, my husband, Ryan, and my mom. Ryan, I honestly cannot express how happy I feel to have met you at Dr. Kaufman's lab! You are my best friend and life partner! Thank you for being patient with me and for your unconditional selfless love. It is beautiful how we have been able to share this educational journey together, I am so proud of you as well! Finally, I want to thank my mom. My mom is a very special woman, who from an early age told me I am capable of accomplishing anything I set my mind to. Mom, thank you so much for all your hard work and sacrifice. Your sacrifice and love has given me the opportunity to pursue this Ph.D. This degree is dedicated to you. Thank you for being my cheerleader and for always encouraging me to reach for the stars!

## **DEDICATION**

I dedicate this project to my hardworking superwoman mom, Mary. Mamá, gracias por todo tu apoyo, sacrificio, por creer en mis sueños, y especialmente por creer en mi. Te quiero mucho y te dedico este proyecto a ti.



## TABLE OF CONTENTS

<b>ABSTRACT .....</b>	<b>ii</b>
<b>ACKNOWLEDGEMENTS .....</b>	<b>iv</b>
<b>DEDICATION .....</b>	<b>vi</b>
<b>TABLE OF CONTENTS .....</b>	<b>vii</b>
<b>LIST OF TABLES .....</b>	<b>x</b>
<b>CHAPTER 1 .....</b>	<b>1</b>
INTRODUCTION.....	1
<b>CHAPTER 2 .....</b>	<b>5</b>
LITERATURE REVIEW .....	5
Challenging Factors .....	6
Intersectionality .....	8
Supportive Factors .....	11
Purpose of Study .....	15
Research Questions .....	15
<b>CHAPTER 3 .....</b>	<b>17</b>
METHOD .....	17
Participants .....	17
Measures .....	19
Procedure .....	20
Data Analysis .....	21
Trustworthiness .....	23
<b>CHAPTER 4 .....</b>	<b>24</b>

RESULTS .....	24
Demographic and Contextual Data .....	24
Research Question 1 .....	28
Research Question 2 .....	80
Research Question 3 .....	106
<b>CHAPTER 5 .....</b>	<b>112</b>
DISCUSSION .....	112
Supportive Factors in Doctoral Programs .....	112
Challenging Factors in Doctoral Programs .....	116
Impact of Multiple Social Identities on Doctoral Educational Experiences.....	119
Recommendations for Incoming Doctoral Students of Color in STEM .....	122
Limitations and Methodological Considerations.....	123
Directions for Future Research.....	125
Contributions of Present Study.....	126
Contributions to the Field of School Psychology.....	127
<b>Appendix A Demographic Questionnaire .....</b>	<b>129</b>
<b>Appendix B Interview Guide .....</b>	<b>131</b>
<b>Appendix C Recruitment E-mail/Recruitment Letter .....</b>	<b>135</b>
<b>Appendix D Flyer .....</b>	<b>137</b>
<b>Appendix E Social Media Announcement .....</b>	<b>138</b>
<b>Appendix F Letter to Academic Enrichment Directors/Program</b>	
<b>Coordinators.....</b>	<b>140</b>
<b>Appendix G Consent Form .....</b>	<b>142</b>

<b>Appendix H Statement on Diversity in Research .....</b>	<b>145</b>
<b>BIBLIOGRAPHY .....</b>	<b>146</b>

## LIST OF TABLES

TABLE	PAGE
Table 1. Length of Time Living in the Contiguous U.S. for Those Born Outside the U.S.....	18
Table 2. Doctoral Degree in STEM Enrolled in.....	24
Table 3. Current Year in Doctoral Program.....	25
Table 4. Participation in Minority Research Preparation Programs.....	26
Table 5. Current University Participants Are Attending .....	27
Table 6. In Your View, What Has Contributed to Your Success in Your Doctoral Program?.....	28
Table 7. What Personal Characteristics or Qualities Have Helped You Through This Process?.....	31
Table 8. What Role Has Faculty or Peer Mentoring Played in This Process?.....	34
Table 9. How Has Peer Support Been in Your Program?.....	38
Table 10. Have Other Social Support Systems in Your University, but Outside Your Graduate Program, Been Helpful During This Process?.....	41
Table 11. Has Your Program Provided an Academic Curriculum That Has Been Culturally Relevant to You? For Example, Are Cultural Issues Integrated Into Classroom Materials, Discussions, and Illustrations?.....	44
Table 12. What About Financial Aid?.....	46
Table 13. Have You Participated in any Academic Enrichment Programs (e.g., McNair Scholars Program, Minority Access to Research Careers, etc.) That Have Facilitated Your Success in Your Doctoral Program?.....	50
Table 14. What About Support Systems Outside of School (i.e., Family,	

Religion/Spirituality, or Participation in Professional Associations)?.....	54
Table 15. In Your View, What Challenges Have You Encountered in Your Doctoral Program?.....	58
Table 16. How Would You Describe Your Experiences as a Person of Color on Campus?.....	62
Table 17. Have You Ever Felt Isolated in Your Program, Department, or Institution?.....	66
Table 18. Tell Me About the Gender/Racial Make-up in Your Classes. How Has This Impacted You?.....	68
Table 19. Do You Encounter Difficult Dialogues on Race/Ethnicity, Sexual Orientation, Disability, Religion, Social Class, Age, Immigration, or Gender in the Classroom or Lab Settings?.....	73
Table 20. As a Person of Color Have You Experienced Behavior or Language That Has Made You Feel Excluded, Slighted, or Uncomfortable (i.e., Racial Microaggressions)?.....	78
Table 21. In Your View, How Have Your Various Social Identities Impacted Your Doctoral Educational Experiences?.....	80
Table 22. What Has Been the Impact of Your Gender?.....	84
Table 23. What About Your Race/Ethnicity?.....	87
Table 24. What Has Been the Impact of Your Social Class?.....	90
Table 25. What About Age?.....	93
Table 26. If You Practice a Religion, What Has Been the Impact of That?.....	96
Table 27. In Terms of Sexual Orientation, How Has That Impacted Your Doctoral	

Educational Experiences?.....	98
Table 28. What About Other Social Identities, Such as Ability/Disability, Language Fluency, Immigration Status, or any Other Social Identities I Did Not Mention Here? How Have They Impacted Your Doctoral Educational Experiences?.....	101
Table 29. If You Were Talking to a Group of Racial/Ethnic Minority Students Who Just Got Accepted Into Your Doctoral Program, What Do You Think They Should Know Before They Get Started? What Recommendations Would You Provide to Them to Increase Their Success in the Program?.....	106

## CHAPTER 1

### INTRODUCTION

According to the U.S. Census (2015), the demographic composition of the U.S. is projected to shift over the next five decades. By 2060, the Latino population is expected to grow from 17% to 29%, Asians are projected to increase from 5.4% to 9.3%, African Americans are estimated to rise from 13% to 14%, American Indians/Alaska Natives are predicted to expand from 1.2% to 1.3%, and Native Hawaiians/Pacific Islanders are expected to increase from 0.2% to 0.3%. In contrast, the population of Non-Hispanic Whites is projected to decrease from 62.2% to 43.6%. These changes in demographics are predicted to produce a plurality nation by the year 2060, in which racially/ethnically underrepresented groups, as a whole, will compose approximately 56% of the total U.S. population.

Higher education enrollments have also changed demographically, but at a slower pace. Over the past three decades, the college enrollment rate of racial/ethnic minorities has increased (Aud, Fox, & Kewalramani, 2010). Specifically, from 1976 to 2008, the number of Latinos enrolled in institutions of higher learning rose from 3.7% to 12.9%, Asians and Pacific Islanders increased from 1.8% to 6.8%, African Americans grew from 10% to 13.9%, and American Indians/Alaska Natives rose from 0.7% to 1.1%. Although the percentages of racial/ethnic minorities at colleges and universities have increased, racial disparities exist in higher education. According to Swail, Redd, and Perna (2003) the increases in college enrollments of racial/ethnic minorities have not been equally observed in degree production rates. To date, students of color, with the exception of Asian/Pacific Islander students, obtain

undergraduate degrees at significantly lower rates in comparison to White students. In fact, White and Asian/Pacific Islander students are two to three times more likely to receive an undergraduate degree than Latino, African American, and American Indian/Alaska Native students (Swail, Redd, & Perna, 2003). Although these rates are alarming, racial disparities in higher education are even further magnified at the undergraduate and graduate level in the fields of Science, Technology, Engineering, and Mathematics (STEM).

Currently, the proportion of Latino, African American, and American Indian/Alaska Native students is severely lacking in STEM disciplines in comparison to White and Asian/Pacific Islander students. Although 25% of all bachelor degrees were conferred in a STEM field of study in the 2009-2010 academic year, White and Asian/Pacific Islander students jointly comprised 61% of all STEM baccalaureate recipients. In contrast, only 20% of Latino students, 21% of African Americans, and 23% of all American Indian/Alaska Native students obtained an undergraduate degree in STEM (Ross et al., 2012). Similarly, when examining racial and ethnic diversity at the graduate level, students of color, with the exception of Asians, represented only 13.7% of Master's degree recipients and 7.3% of all doctorates in STEM fields of study (National Science Foundation [NSF], 2015).

These educational trends are concerning. Although racial/ethnic minorities currently comprise 37.8% of the U.S. population, a lack of parity exists in the overall post-secondary educational attainment of Latinos, African Americans, and American Indian/Alaska Native students, relative to their representation in the U.S. population (U.S. Census, 2015). These racial/ethnic minority groups are not only less likely to



graduate from an institution of higher learning, but they are also significantly underrepresented in STEM disciplines and consequently, much less likely to receive a post-graduate degree in a STEM field (NSF, 2015; Ross et al., 2012). Given the critical needs in STEM disciplines, these findings are disconcerting. President Barack Obama and the U.S. Department of Education acknowledged the importance of STEM education by highlighting its influence on improving the country's scientific advancement, innovation, and global competitiveness (U.S. Department of Education, 2015).

Although it is unknown how the policies of the current president, Donald Trump, may impact the demographics of the U.S., as it stands, it is estimated that by 2060 racial/ethnic minorities will comprise 56% of the U.S. population. It is important to continue to invest in recruiting and retaining more students of color in STEM fields, especially Latinos, African Americans, and American Indian/Alaska Natives (who NSF identifies as severely underrepresented minorities [URMs] in STEM; NSF, 2015). The recruitment of URMs is essential for competing in the global market. Underrepresented minority students are an untapped source of talent. In order to innovate, increase scientific discovery, and solve today's problems, different perspectives and ideas are needed. Traditionally minoritized students bring with them experiences and perspectives that are critically lacking and needed in all branches of science.

In order to further understand why Latinos, African Americans, and American Indians/Alaska Natives are severely underrepresented in STEM, it is important to examine both the challenges, as well as the supportive factors, that current URMs in

STEM disciplines experience, especially those pursuing advanced degrees. Currently, a lack of literature exists on the challenging and supportive factors encountered by students of color in STEM doctoral programs. This study aimed to fill this gap, by qualitatively examining the factors that have facilitated or hindered the educational success of these important segments of the U.S. population.

## CHAPTER 2

### LITERATURE REVIEW

Over the past 30 years, the demographics of the general U.S. population have shifted and are projected to continue to evolve (U.S. Census, 2015). Changes in the demographic make-up have also been observed in university enrollment rates; however, they have not translated into degree attainment, with only a small percentage of racial and ethnic minorities earning post-secondary degrees, especially in STEM disciplines (Ross et al., 2012). Research indicates that the low degree attainment of Latinos, African Americans, and American Indians/Alaska Natives in STEM may be a result of the various barriers these students encounter throughout the STEM academic pipeline (Swail, Redd, & Perna, 2003). According to Maton, Shauna, McDougall, and Freeman (2012), many URMs are presented with key challenges at various critical points, including prior to entering college, while pursuing undergraduate and post-graduate STEM degree programs, and even after obtaining a graduate degree. Specifically, findings by Maton, Freeman, and Hrabowski (2004) indicate that URMs are likely to experience cultural and academic isolation, susceptibility to stereotype threat, low expectations from instructors, lack of peer support, and discrimination in their pursuits of a STEM degree.

When considering the damaging impact these factors may have on students' educational experiences, the steep decline of URMs throughout the STEM academic pipeline is placed into context. As illustrated by the most recent report by NSF, in 2012 URMs represented 18.8% of STEM baccalaureate recipients, 13.7% of Master level graduates, and only 7.3% obtained a doctoral level degree (NSF, 2015). In

contrast, White students represented 60.1% of STEM bachelor degrees, 45.5% of Master's, and 43.2% of doctorates (NSF, 2015). These educational trends highlight the importance of continuing to examine the challenges that hinder the educational attainment of doctoral students of color, as well as the supportive factors that protect and encourage these students to persist academically in the face of adversity.

### **Challenging Factors**

**Campus Racial Climate and Racial Microaggressions.** Research indicates that graduate students of color encounter challenges in the form of adverse campus racial climates and racial microaggressions (RMs), particularly at predominately White institutions, which constitute the majority of institutions of higher learning in the U.S. (Brown & Dancy, 2010). The campus racial climate is composed of four dimensions, including the institution's historical legacy of inclusion or exclusion; the structural diversity of the institution (e.g., university admission practices and financial aid policies); the psychological racial climate of the campus, including student's perception of group relations, as well as the institutional response to discrimination and racial conflict; and the behavioral climate of the institution. The behavioral climate is defined as the interactions that actually occur on campus between and within racial/ethnic groups (Hurtado, Clayton-Pedersen, Allen, & Milem, 1998). Racial microaggressions refer to the brief everyday "verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults toward people of color" (Sue et al., 2007, p. 271).

Research at the graduate level indicates that across various disciplines (e.g.,

Physical and Health Sciences, Psychology, Humanities, and Education) the majority of racial/ethnic minority students characterize the campus racial climate of their universities, departments, and programs, as racially and culturally isolating (Gay, 2007; Robinson, 2012; Torres, Driscoll, & Burrow, 2010). Specifically, graduate students of color at predominately White institutions in the studies reviewed reported that they were often the only one or one of very few students of color in their classes; encountered difficult dialogues on race in the classroom; highlighted that there was a significant lack of faculty of color in their departments; and noted that the aesthetics of their campuses (e.g., artwork and buildings) lacked racial, cultural, and linguistic diversity (Gay, 2007; Sue, Lin, Torino, Capodilupo, & Rivera, 2009). Graduate students of color reported that these isolating factors decreased their sense of belonging and made it challenging to navigate the graduate academic terrain, as they often did not have peers or faculty of similar backgrounds that they could share their experiences with (Gay, 2007).

Graduate students of color in Physical and Health Sciences, Psychology, Humanities, and Education programs also reported RMs in the areas of invisibility/hypervisibility, ascriptions of intelligence, and treatment as second-class citizens (Gay, 2007; Robinson, 2012; Shah, 2008; Torres et al., 2010). Specifically, they reported feeling invisible in programs that minimized the importance of multicultural issues (Shah, 2008). Similarly, they noted that by virtue of being the only one or one of very few racial and ethnic minorities in their departments, they also experienced hypervisibility. Students experiencing hypervisibility reported that they were often expected to serve as the “cultural voice” in their classes. Other studies have

found that even at the doctoral level, Latino and African American students were treated as second-class citizens and their intellectual capabilities were frequently questioned in comparison to their White peers (Robinson, 2012; Torres et al., 2010).

Overall, the findings on campus racial climate and RMs reveal some of the challenges experienced by graduate students of color in an academic setting. As the results indicate, racial and ethnic minority students pursuing advanced degrees encounter invalidating and isolating academic environments and are the targets of RMs by students and faculty. These findings are concerning and underscore the importance of investigating how these factors are manifested at the doctoral level among students of color in STEM, who may have an increased likelihood to experience RMs and adverse campus climates due to their severely unrepresented status in STEM departments and programs.

**Intersectionality.** In addition to negative campus racial climates and RMs, graduate students of color also encounter unique challenges in an academic setting based on the various social identities they possess. The interaction of an individual's social identities is referred to as *intersectionality*, which considers the role of multiple social identities, such as gender, social class, ability, sexual orientation, and religion, to name a few (McCall, 2005). Although research on intersectionality is limited, a small subset of studies has investigated the interaction of race/ethnicity and gender on the educational experiences of students in STEM.

The literature on both women and men of color in STEM show that these groups experience unique challenges as a result of their race and gender. Women of color, in particular, are placed in what Malcolm and colleagues (1976) refer to as a

“double bind.” Racial and ethnic minority women experience both of the difficulties associated with being a woman, as well as a person of color, in a field that is historically represented by White males. This double bind places a unique set of challenges on women of color as they develop as scientists.

For example, a longitudinal qualitative study by Carlone and Johnson (2007), which examined the educational experiences of women of color as they pursued their undergraduate and graduate degrees in STEM, found that participants’ phenotype impacted the level of recognition the student received. Specifically, they found that women of color who had lighter skin were more likely than women with darker skin to be accepted and recognized by their faculty and peers as a “scientist.” Similarly, a study by MacLachlan (2006), which investigated the experiences of 63 White and racial/ethnic minority women who received doctorates in Science and Engineering, found that the majority of them viewed their gender as a factor impacting nearly all aspects of their educational experiences. These women reported that they were often the only one or one of very few women in their advisor’s laboratory and found it difficult to interact with their male colleagues. They also reported that they had to be more aggressive than their male peers if they wanted their work to be recognized. Women of color, in particular, noted that they felt faculty often treated them differently due to their double minority status. For example, women of color reported that their advisors frequently directed them to applied, rather than theoretical areas; underestimated their intellectual capabilities; and did not treat them as future scientists, but rather as representatives of their race. MacLachlan found that the

cumulative effect of these experiences led many talented women of color to drop out of their programs prior to graduation.

In addition to the challenges experienced by women of color, research also indicates that men of color encounter difficulties while pursuing degrees in STEM disciplines due to their gender and race. A study by Strayhorn, Long, Kitchen, Williams, and Stentz (2013) examining the academic and social barriers faced by undergraduate Latino and African American male students in STEM, found that these men experienced alienation and invisibility in their programs. They also felt isolated, as their programs lacked faculty and peers from similar backgrounds. The men reported that unlike their White and Asian male peers, their contributions in the classroom often went unacknowledged by their professors, leading to feelings of invisibility. Moreover, the men also noted that they often felt unable to identify with faculty and experienced pressure to be a representative of their race. Other research findings have also indicated that men of color, particularly Black male students, are more likely to be presumed to be a criminal by the campus community (Solorzano, Ceja, & Yosso, 2000; Sue, Capodilupo, & Holder, 2008). For instance, a study by Yosso, Ceja, and Solorzano (2000), found that campus police often targeted Black students at social functions and campus events. Participants in the study reported that campus police often tried to shut down Black social functions, whereas the same did not occur at social events with a predominately White audience.

As a collective these studies highlight the importance of examining the intersection of race and gender. Although some research has examined the educational experiences of both women and men of color in STEM as they pursue their degrees,



few studies have explored these factors at the doctorate level. In addition, research on the impact of other social identities such as disability, social class, sexual orientation, language fluency, acculturation, and immigration status has been absent and is needed to further understand the academic challenges experienced by STEM doctoral students of color with multiple social identities. The present study was designed to fill these gaps in the literature by examining the impact that various social identities have on the educational experiences of doctoral students in STEM disciplines.

### **Supportive Factors**

In addition to the literature on the challenges encountered by students of color as they obtain advanced degrees, it is also important to examine the research on the factors that have facilitated their academic success. The following section focuses on these factors by reviewing the available literature on the variables that have supported the educational attainment of students of color.

**Personal qualities.** Resilience, self-efficacy, and determination have been identified as three positive factors supporting URM students' persistence in STEM academic programs (Colbeck, Cabrera, & Terenzini, 2001; MacLachlan, 2006; Meir, 2002; Thompson, 1998). Resilience is defined as an individual's ability to persevere in the face of adversity. Specifically, resilience comprises a person's ability to develop a positive sense of identity, solve problems, plan for the future, and maintain an optimistic outlook on life (Yates & Masten, 2004). Studies on resilience have found that teachers have the ability to promote resiliency skills in their students (Meir, 2002; Thompson, 1998). For example, Thompson (1998) found that when teachers provided

effective and supportive teaching, racial/ethnic minority students in STEM were more likely to exhibit resilience and demonstrate increased academic achievement.

In addition to resilience, a student's self-efficacy has also been found to have a positive impact on STEM academic success (Colbeck, Cabrera, & Terenzini, 2001). Self-efficacy is defined as the confidence an individual has in their ability to learn and succeed (Zimmerman, Bandura, & Martinez-Pons, 1992). A study by Correll (2001) found that when students of color perceived their math academic ability as high, they were more likely to enroll in STEM classes and major in a STEM field of study. Furthermore, determination, as expected, has also been found to be a factor associated with STEM degree attainment. For example, a study by MacLachlan (2006), which investigated the graduate school experiences of African American doctoral students in the sciences and engineering, found that determination was a pivotal personal characteristic that allowed these students to succeed in earning their doctoral degrees.

**Program level support systems.** In addition to personal qualities, program level factors such as mentoring, peer support, and culturally relevant pedagogy have also been shown to positively impact the retention and success of students of color in STEM. Mentoring, in particular, has been identified as a key variable in the educational attainment of URMs (Kreuter et al., 2011). A study by Grandy (1998) found that the mentorship a student of color receives from faculty and peers is one of the most influential variables in fostering a student's academic engagement and persistence in STEM. In addition to mentoring, studies have also found that peer support positively influences the academic retention of students of color. For instance, a study by Tinto (1993) found that a student's ability to persist in college was highly

dependent on their ability to develop social support systems in their institutions. Similarly, research by Zea, Reisen Beil, and Caplan (2003) found that students of color at predominately White institutions that possess strong social connections to their campus community were more likely than non-integrated minority students to persist in college.

Lastly, in addition to mentorship and peer support, culturally relevant pedagogy has also been identified as a supportive factor for augmenting the educational attainment of students of color (Denson, Avery, & Schell, 2010). Culturally relevant pedagogy has been found to motivate students of color to pursue STEM careers (Villegas & Lucas, 2002). As Villegas and Lucas (2002) highlight, when science is made culturally relevant, students of color are more likely to recognize the societal benefits associated with pursuing a degree in STEM and consequently are more apt to view science as a positive tool for improving their communities.

**University level support systems.** In terms of university level supportive factors, financial aid and participation in academic enrichment programs have been found to facilitate the educational experiences of students of color (National Academy of Sciences, 2011; Koenig, 2009; Rogers & Molina, 2006). Financial aid, in particular, has been regarded by the National Academy of Sciences (2011) as one of the most important variables for increasing recruitment and decreasing attrition of talented URM students in STEM. Moreover, studies examining the role of financial aid have found that when undergraduate students of color in STEM are provided funding in the form of paid internships or research assistantships, they are more likely

to not only further develop their scientific skills, but are also better able to socially integrate into their programs and departments (Koenig, 2009; National Academy of Sciences, 2011).

In addition to financial aid, academic enrichment programs, such as the University of Maryland, Baltimore County's Meyerhof Scholar Program and the University of California at Berkeley's Biology Scholars Program, are examples of the positive impact that enrichment programs can produce (Koenig, 2009). These programs, which focus on providing racial/ethnic minority students with mentorship, access to research opportunities, and financial assistance, have resulted in higher undergraduate graduation rates and increased post-graduate enrollment. For instance, 87% of racial/ethnic minority students in the Meyerhof Scholar Program were able to successfully earn an undergraduate degree in STEM and a large proportion went on to pursue doctoral degrees. Similarly, students of color in Berkeley's Biology Scholars Program were more likely than students of color not enrolled in the program to graduate from college (Koenig, 2009). Although financial aid and enrichment programs have been found to support the educational experiences of students of color, research is limited on how these factors impact students of color in STEM doctorate programs.

**Community level support systems.** Community level factors, such as family, religion/spirituality, and participation in professional associations have also been found to support students of color as they obtain advanced degrees. For example, a study by Alexander (2011) found that African American graduate students at predominately White institutions utilized family support systems and

religion/spirituality in order to cope with the challenges experienced in academic settings. Similarly, other studies have indicated that students of color receiving familial support are more likely to exhibit academic motivation and obtain higher grades (Meeuwise, Born, & Severiens, 2014). Moreover, participation in professional associations has also been deemed as a supportive factor. According to Giordano, Davis, and Licht (2011), participation in professional organizations provides students of color with opportunities to network and build connections with fellow students and faculty of color, thus reducing the isolation that many minority students experience at predominately White institutions.

### **Purpose of Study and Research Questions**

Although some research has examined the barriers and supportive factors experienced by students of color, to date little is known on how these factors are manifested at the doctorate level and within STEM disciplines. Similarly, few studies on graduate students of color have examined the interaction between an individual's multiple social identities and their educational experiences. The purpose of this study was to fill these gaps in the literature by qualitatively examining the challenging and supportive factors doctoral students of color in STEM experience in an academic setting. Specifically, the present study addressed the following research questions: (1) What are the supportive and challenging factors underrepresented minority students encounter in an academic setting as they obtain doctorates in STEM fields of study? (2) What is the impact of multiple social identities on the educational experiences of STEM doctoral students of color? And (3) What recommendations would doctoral

students of color in STEM provide to other underrepresented racial/ethnic minority students who are starting their doctoral programs in a STEM field?

## CHAPTER 3

### METHODOLOGY

#### Participants

Twelve self-identified students from URM backgrounds enrolled in STEM doctoral degree programs at predominately White institutions in the U.S. participated in semi-structured, audiotaped telephone interviews. The sample included both females ( $n = 8$ , 66.66%) and males ( $n = 4$ , 33.33%). Participants' age ranged from 25 to 34 ( $M = 28.08$ ,  $SD = 2.53$ ) and they identified their race or ethnicity as Latina/o ( $n = 8$ , 66.66%), African American ( $n = 3$ , 25%), and Afro-Latina ( $n = 1$ , 8.33%). Further, in terms of nationality, 75% ( $n = 9$ ) reported to be originally from the U.S. (four participants from this subset identified as Puerto Rican), Mexico ( $n = 2$ , 16.66%), and the Dominican Republic ( $n = 1$ , 8.33%). For participants who were born outside the contiguous U.S., Table 1 details the number of years they have lived in the contiguous U.S.. Specifically, length of time ranged from 3 to 25 years ( $M = 10$ ,  $SD = 7.57$ ). None of the participants reported being undocumented; however, one participant specified to be currently on a student visa and another participant reported previously being undocumented.

In terms of current state of residence, participants indicated that they lived in Connecticut ( $n = 2$ , 16.66%), Illinois ( $n = 2$ , 16.66%), Florida ( $n = 1$ , 8.33%), Iowa ( $n = 1$ , 8.33%), Louisiana ( $n = 1$ , 8.33%), Massachusetts ( $n = 1$ , 8.33%), Michigan ( $n = 1$ , 8.33%), New York ( $n = 1$ , 8.33%), Ohio ( $n = 1$ , 8.33%), and Washington, D.C. ( $n = 1$ , 8.33%). The majority of participants reported their socioeconomic status as low-income ( $n = 9$ , 75%) and three (25%) identified as middle-income. In terms of

language, all participants reported speaking English. In addition to being fluent in English, 11 out of 12 participants spoke a second language. Specifically, participants were fluent in Spanish ( $n = 8, 66.66\%$ ), French ( $n = 2, 16.66\%$ ), and Haitian Creole ( $n = 1, 8.33\%$ ).

In terms of marital status, 11 (91.66%) participants reported being single and one (8.33%) was married. Participants also identified their sexual orientation as heterosexual ( $n = 10, 83.33\%$ ), bisexual ( $n = 1, 8.33\%$ ), and homosexual ( $n = 1, 8.33\%$ ). Additionally, in regards to disability, 11 (91.66%) participants indicated that they were able-bodied and one (8.33%) reported having a physical disability. Half of participants ( $n = 6, 50\%$ ) specified that they were currently practicing a religion (i.e., Catholicism or Christianity), whereas the remaining half ( $n = 6, 50\%$ ) identified as non-religious. All participants in this study completed at least one year of doctoral work in a STEM field of study and were in good academic standing (i.e., had a minimum of a 2.7 grade point average).

Table 1

*Length of Time Living in the Contiguous U.S. for Those Born Outside the U.S.*

Length of time in years	<i>n</i>	%
3	1	16.66%
4	1	16.66%
5	1	16.66%
10	1	16.66%
13	1	16.66%
25	1	16.66%

*Note.* N = 6.



## **Measures**

Participants responded to a set of demographic and personal background and interview questions. Below is a description of each measure used.

**Demographic Questionnaire.** The demographic and personal background questionnaire was developed to obtain pertinent information regarding the characteristics of the sample in the present study (see Appendix A). Specifically, participants reported their race/ethnicity, gender, age, sexual orientation, presence of a disability, marital status, religion, socioeconomic status, language(s) spoken, immigration status, current state of residence, country of origin, and years lived in the U.S. (if applicable). In addition to these questions, participants also provided information regarding their highest degree completed, the university they were attending, the STEM doctoral program they enrolled in (as well as current year in the program), whether or not they were the first in their family to attend a doctoral program, previous participation in a minority research preparation program, and the region they attended undergraduate school.

**Interview Guide.** A semi-structured interview guide containing 24 questions was created to address the three research questions of this study (see Appendix B). The semi-structured interview format was selected based on the openness and flexibility it allows throughout the interview process (Kvale, 1996). Through this format, the researcher is able to prepare pre-determined questions in advance; however, the interviewer is also able to ask follow up questions and is granted flexibility in the sequence and form of the questions asked during the interview (Kvale, 1996). Semi-structured interviews were appropriate for this study given that it

allows the interviewer to gain information about participants' experiences, as well as information about the meaning that participants ascribe to those experiences (Seidman, 2006). Questions in the interview guide addressed the supportive and challenging factors URM students have encountered in STEM doctoral programs, as well as the impact their various social identities have had on their academic experiences. Furthermore, at the end of the interview, participants were also asked if they had any advice for other students of color starting STEM doctoral programs.

### **Procedure**

Prior to study implementation, the University of Rhode Island Institutional Review Board reviewed and approved the methods and procedures of this study. Upon receiving study approval, data collection commenced. Specifically, snowball and purposive sampling techniques were utilized for participant recruitment based on the stated eligibility criteria. Participants were recruited through various methods, including recruitment e-mails/letters (see Appendix C), flyers (see Appendix D), social media announcements (see Appendix E), and e-mails to academic enrichment program directors/coordinators (see Appendix F).

Potential participants were contacted and sent a recruitment letter, as well as a consent form (see Appendix G). The recruitment letter provided information on the nature of the study, time requirements, incentives for participation, as well as the eligibility criteria for inclusion in the study. Participants who met the eligibility criteria were asked to sign and return the consent form to the researcher. In addition to the recruitment letter, the consent form provided participants with information on the goals of the study, risks and benefits associated with participation, as well as how

participants' confidentiality would be maintained throughout the completion of the study. After receipt of the signed consent form, audio recorded semi-structured interviews, lasting approximately 30-45 minutes, were scheduled and conducted by phone with eligible participants. A second interview was scheduled if additional information or clarification was needed, or in the event that technical difficulties occurred during the interview process. Upon completion of the study, participants were provided with a \$25 gift card as compensation for their participation.

Once each interview was completed, the interviews were transcribed verbatim by two research assistants, both who were trained by the primary researcher. During this process, any identifiable information was removed from the transcripts and pseudonyms were utilized to ensure anonymity and preserve confidentiality of participants. Further, each audio recording and transcript was reviewed multiple times to ensure accuracy of information and various procedures were implemented in this study to achieve trustworthiness of findings. This transcription process enabled the researcher to obtain a deeper understanding and familiarity with the collected data and served as the first stage of analysis (Braun & Clarke, 2006). The primary researcher also trained both of the research assistants to serve as secondary data coders. Lastly, throughout the research process, the primary researcher engaged in self-reflection and remained cognizant and attuned to how her values, social identities, experiences, and interests influenced this research study.

### **Data Analysis**

The data was analyzed both quantitatively and qualitatively. Quantitative analyses were performed to analyze demographic and personal background data, while

the interview data employed a qualitative descriptive approach. The aim of qualitative descriptive research is to investigate new areas of inquiry by asking direct questions and developing a comprehensive summary of events (Sandelowski, 2000). The collected qualitative data was analyzed by utilizing content analysis. Content analysis is a technique that examines the subject, the context, as well as the similarities and differences in qualitative data (Graneheim & Lundman, 2004) and is considered a flexible method for the analysis of text data (Cavanagh, 1997). Specifically, the analysis focused on identifying manifest content. Manifest, also known as surface-level content, refers to what participants directly say in their interviews (Graneheim & Lundman, 2004).

The first step in analyzing manifest content began by listening to and reading each interview several times in order to obtain a general impression of the data. Next, the main text that represented the research questions was identified. Two researchers independently broke down this data into smaller units or codes (Graneheim & Lundman, 2004). Codes were applied to each question and coders met to discuss results. Once this step was completed, the researchers proceeded to compare and discuss the codes until at least 90% agreement was reached. This process continued until all data in all of the interviews were coded. Researchers also considered the similarities and differences across interviews and codes. This information was included under developing categories. Further, participant's narratives were used as a method to present the results from this study. Specifically, quotations were utilized to illustrate the lived experiences of participants (White & Marsh, 2006).

## **Trustworthiness**

Trustworthiness is a pivotal part of conducting qualitative research. According to Lincoln and Guba (1985), trustworthiness can be achieved when credibility, transferability, dependability, and confirmability of research have been established. Specifically, *credibility* refers to how well the data and analysis address the intended focus of the study, *transferability* focuses on the applicability of the findings, *dependability* refers to consistency of the findings, and *confirmability* is based on the neutrality of the findings (Lincoln & Guba, 1985).

Trustworthiness was achieved in this study through the implementation of various procedures. First, all interviews underwent member checking to ensure that a clear understanding of the participants' responses was obtained. Member checking was performed at the end of each interview by sharing with the participant the main topics that emerged from the interview and seeking clarification if necessary. Second, in order to reduce bias, two researchers independently analyzed and interpreted all collected data. Third, an "audit-trail" was completed to ensure transparency of the research process. The audit trail allowed for the research process to be clearly documented and examined by an auditor (Lincoln & Guba, 1985). Lastly, trustworthiness was also achieved by the utilization of quotations in order to accurately represent the experiences of participants, as well as by maintaining routine communication with an individual who is an expert in qualitative research.

## CHAPTER 4

### RESULTS

#### Demographic and Contextual Data

Participants provided personal background information regarding several features of their status. Questions covered various areas including (a) the highest degree they completed, (b) if they were the first in their family to attend a doctoral program, (c) the doctoral degree in STEM they are currently pursuing, (d) their year in the doctoral program, (e) if they participated in a minority research preparation program in their undergraduate or graduate institution, (f) the university they are currently attending, and (g) the region in which they completed their undergraduate degree.

In terms of highest degree completed, 9 (75%) participants held a Bachelors degree and 3 (25%) had previously completed a Masters degree in a related STEM field. The majority of participants ( $n = 10$ , 83.33%) reported being the first in their family to attend a doctoral program. Only two participants (16.66%) had a family member who had previously completed a doctorate. Moreover, participants reported a high variability in terms of the doctoral degrees they are pursuing (see Table 2) and their current year in the program (see Table 3).

Table 2

#### *Doctoral Degree in STEM Enrolled in*

Degree Program	<i>n</i>	%
Chemistry	2	16.66%
Physical Chemistry	1	8.33%

Biochemistry	1	8.33%
Molecular and Cellular Biology	1	8.33%
Cancer and Cell Biology	1	8.33%
Developmental Psychology	1	8.33%
Neuroscience	1	8.33%
Computer Science	1	8.33%
Human Centered Computing	1	8.33%
Mathematics	1	8.33%
Industrial Engineering	1	8.33%

---

*Note.* N = 12.

Table 3

*Current Year in Doctoral Program*

---

Year	<i>n</i>	%
Third Year	5	41.66%
Fourth Year	3	25%
Fifth Year	2	16.66%
Sixth Year	1	8.33%
Second Year	1	8.33%

---

*Note.* N = 12.

As shown in Table 2, participants were represented in all main areas of STEM; however, the field of science had the highest representation ( $n = 8$ , 66.66%), followed by technology ( $n = 2$ , 16.66%), engineering ( $n = 1$ , 8.33%), and math ( $n = 1$ , 8.33%). Table 3 also showed that the majority of participants ( $n = 5$ , 41.66%) were in the third

year of their doctoral program. Participants also reported being involved (previously or presently) in various minority research preparation programs (see Table 4).

Table 4

*Participation in Minority Research Preparation Programs*

Name of Program	<i>n</i>	%
Ronald E. McNair Scholars Program	3	25%
Minority Access to Research Careers	2	16.66%
Louis Stokes Alliances for Minority Participation – Bridge to Doctorate	2	16.66%
Research Experiences for Undergraduates Summer Program	2	16.66%
Research Initiative for Scientific Enhancement Program	1	8.33%
Summer Pre-Doctoral Institute	1	8.33%
Summer Research Opportunities Program	1	8.33%
Yale Ciencia Academy	1	8.33%
Neuroscience Scholars Program	1	8.33%
Science, Technology, Engineering and Mathematics Education through Research	1	8.33%

*Note.* Total does not equal 12 (100%) because some participants were part of more than one program.

Specifically, a high percentage of participants ( $n = 9$ , 75%) indicated that they had been part of such programs. Further, participants in this study came from various universities (see Table 5). As depicted in Table 5, most participants were enrolled in universities in the Midwest ( $n = 5$ , 41.66%), followed by institutions in the Northeast ( $n = 4$ , 33.33%), as well as universities in the South ( $n = 3$ , 25%). Lastly, participants



also provided information regarding the region of the U.S. in which they attended undergraduate school. Participants reported attending undergraduate universities in Puerto Rico ( $n = 4$ , 33.33%), the South ( $n = 3$ , 25%), Northeast ( $n = 2$ , 16.66%), Midwest ( $n = 1$ , 8.33%), West ( $n = 1$ , 8.33%), and one participant (8.33%) reported completing undergraduate school in Mexico.

Table 5

*Current University Participants Are Attending*

University Name	<i>n</i>	%
University of Illinois at Urbana-Champaign	2	16.66%
University of Connecticut	2	16.66%
Louisiana State University	1	8.33%
University of Iowa	1	8.33%
University of Cincinnati	1	8.33%
University of Michigan	1	8.33%
Georgetown University	1	8.33%
University of Massachusetts, Amherst	1	8.33%
University of Florida	1	8.33%
Cornell University	1	8.33%

*Note.*  $N = 12$ .

**Research Questions**

The results of the interviews are organized with respect to the three research questions. For each research question, descriptive tables are provided to summarize the categories or explicit messages elicited from participants. The findings are

presented through the narrative. Accordingly, quotations are used to support the conclusions and interpretations made by the researcher (White & Marsh, 2006).

*Research Question 1: What are the supportive and challenging factors underrepresented minority students encounter in an academic setting as they obtain doctorates in STEM fields of study?*

The first interview question asked participants to describe the factors that have contributed to their success in their doctoral program. Participants' answers fell into seven categories, as illustrated in the following section (see Table 6).

Table 6

*In Your View, What Has Contributed to Your Success in Your Doctoral Program?*

Categories	<i>n</i> (%)
Support from faculty, mentors, advisors, or program directors	6 (50%)
Miscellaneous (e.g., prestige of program, supportive staff, fellowships, personal qualities, downplaying the negative, developing specific skills, structure of program, extracurricular programs)	6 (50%)
Academic enrichment programs	5 (41.66%)
Family, partners, and friends at home	4 (33.33%)
Support from fellow students in the program	4 (33.33%)
Other students of color	3 (25%)
Associations at university	3 (25%)

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Support from faculty, mentors, advisors, or program directors.** Half of the participants indicated that they were able to be successful in their current doctoral program due to the support obtained from faculty, mentors, advisors, or program directors. For example, one participant described how two faculty members, who he initially met during a summer program, were able to play critical roles throughout his doctoral studies:

I got a call from several other professors that I had met in the summer that were really interested in me and they were like, ‘come on, you’re in the running so come on.’ So, it started there, and those same professors have been supporting me here now during the program. Two of them became my advisors, and my primary advisor, and my secondary advisor for some of the projects that I’m doing.

**Miscellaneous.** Participants also provided a variety of responses concerning the factors that contributed to their success in their doctorate program. For example, one participant spoke about the benefits of participating in a fellowship program “I came here in the Fulbright scholarship and so that has been a big help. Just the community that I have met through the Fulbright program and some of the services.” Another participant indicated that her personal qualities have facilitated her success in graduate school “I’m patient, just like that self-quality has really helped.”

**Academic enrichment programs.** A number of participants also reported that involvement in academic enrichment programs (e.g., Ronald E. McNair Scholars Program, Summer Research Opportunity Program [SROP], among others) had a positive impact on their success in their doctoral program. One participant described the benefits of being a Ronald E. McNair Scholar “They gave me the opportunity to do like do research and look in different areas, not just in what I was majoring in, but I did research in a Biology lab, Chemistry lab, in a Technology lab, etc.”

Another participant also spoke about the various benefits of participating in the Summer Research Opportunity Program:

The SROP program that I did here helped me establish connections with different professors and really get to know some of them, to the point where they advocated for me during the time that the admissions came. And, even to the point where my application was incomplete, the GRE scores weren't sent in on time by the...you know by the people who had to send it. And they called me immediately and they said *send them over, whatever you have, well take it. We won't, you know, we don't really consider it, so just send it over cause we're discussing you right now.*

**Family, partners, and friends at home.** A third of participants also indicated that their family, partners, and/or friends at home were key contributors to their academic success. One participant noted the following:

My family from away and I have seen friends here in [*sic*] that kind of made sure I'm on my game and you know kind of helped out whenever I needed anything, so they are definitely in my support system as well.

**Support from fellow students in the program.** Another third of participants also reported that having supportive peers in their program contributed to their success in their doctoral studies. One described the impact of receiving support from her peers:

Just having a bunch of friends in STEM in general that I can talk to on a regular basis, that probably has been the second most amount of help. It's just being able to when you are frustrated or angry about something, it's just to debrief with them and they have a great understanding of what's going on, or at least a good understanding of why it's such a struggle. I... without them I don't know how I would have made it this far, for sure.

**Other students of color.** In addition to the previous responses, a quarter of students also reported that being able to establish relationships with other students of color who were pursuing higher education had a positive impact on their success in their doctoral program. For example, one reported "The other students that were part

of this fellowship were all minority students, so we were all kind of a support system for each other.”

**Associations at university.** Lastly, three participants also indicated that being involved in associations in which they could meet other students who shared an aspect of their social identity or interests aided their success in their doctoral program. In the following quote, a participant described the positive impact of being involved in associations at his university:

We don’t have a very diverse student body (laughs) let me tell you; but the few that are here, we definitely within our program have created a Latino Psychology Association, there is also LGBTQ associations, so I find support in those ‘student lead’ organizations.

In addition to the first interview question, participants were also probed with eight further questions. The first follow-up question was “What personal characteristics or qualities have helped you through this process?” Table 7 represents the five categories that emerged.

Table 7

*What Personal Characteristics or Qualities Have Helped You Through This Process?*

Categories	<i>n</i> (%)
Persistence, determination, self-drive	9 (81.81%)
Adaptable/Ability to reframe situations	4 (36.36%)
Miscellaneous (e.g., maturity, being bilingual, poverty, ability to manage responsibilities)	4 (36.36%)
Openness to learning from others/Asking for help	3 (27.27%)
Mentors/Advisors	2 (18.18%)

---

*Note.* N = 11, Total does not equal 12 (100%) because one participant did not provide an answer to this response category. Further, some participants endorsed more than one response category.

**Persistence, determination, self-drive.** The majority of participants (81.81%) viewed their persistence, determination, and self-drive as the key personal characteristics that have helped them during their doctoral program. One participant described how her persistence has helped her overcome research setbacks:

I would say you know being persistent probably, even if things don't work out the way I expect them. I went through things in my project, for example I lost all my samples like three years of work and I finished up the time over...and you know that is something that you are like 'Oh my God' and I want to give up (laughs) and just running out of the door (laughs). But you know, I just kept going and so persistence.

**Adaptable/Ability to reframe situations.** Other participants considered their ability to adapt to new environments or situations, as well as their ability to reframe situations into a positive manner, as a personal feature that has helped them through the doctoral process. For example, a participant directly spoke about how he has turned failures into lessons:

Every failure that you have is just another lesson that you learn, and you do it better the next time until you get it right. So, I think it's just the ability to change negative outcomes into lessons, so you know, reframing and perspective taking will be something that I would say is there.

**Miscellaneous.** Participants also provided a diversity of responses, including personal attributes such as maturity and how it has served as a motivation to begin a doctoral program. Others noted the positive aspects of speaking two languages, the motivation gained from one's former socioeconomic background, and the ability to

organize and manage time effectively. One participant spoke directly about how poverty has shaped her views of higher education:

I mean in general, just coming from poverty. Like, you don't have any other option, you don't have a... you kind of look around and you're like 'I need to change the situation for myself and for my family' so you don't have another option, you just have to keep going.

**Openness to learning from others/Asking for help.** Participants also noted that having an openness to ask questions and learn from others was an important personal quality to possess in order to succeed in a doctoral program. For example, one participant spoke about how she has learned to seek assistance from her peers:

Not being afraid to sort of ask questions from my peers. So like, the professor...it took a little while longer to get used to them, but being able to still have peer-to-peer interactions and not be shy about it helped a lot during my first two years for sure.

**Mentors/Advisors.** Although not directly related to personal characteristics, two participants answered this question by noting that obtaining support from mentors and advisors has helped them in their doctoral program. For example, one participant reported the following:

It has really helped me out to maintain a strong network of mentors. I still talk to a lot of mentors I have had from undergrad. I had mentors for professional development, just in my personal life as a female in the sciences... in STEM. That's definitely helped me out and it also gives me a lot of opinions on ways I should handle situations.

The second probe asked participants about the role faculty or peer mentoring has played in their pursuits of a doctoral degree. Specifically, participants' responses fell into eight distinct categories (see Table 8).

Table 8

*What Role Has Faculty or Peer Mentoring Played in This Process?*

Categories	<i>n</i> (%)
Miscellaneous (e.g., mentorship/support from other staff, exposure to various perspectives, transition to a large university, prestige of school, support from lab group or other peers)	7 (58.33%)
Limited or no mentorship/support from current faculty	7 (58.33%)
Mentorship/Support from current faculty	6 (50%)
Mentoring/Support from faculty, peers, and/or program director of an academic enrichment program	4 (33.33%)
Mentoring from faculty or students of color	3 (25%)
Mentorship/Support from previous faculty	3 (25%)
Limited or no peer mentoring	3 (25%)
Positive experiences with peer mentoring	3 (25%)

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Miscellaneous.** Over half of the participants reported a variety of answers to this question. Responses included several topics such as, receiving support from staff,



being exposed to research or perspectives in a wide range of areas, difficulties transitioning from a small to a large university, the prestige of their school, as well as the support they received from their lab group or other peers. For example, one participant described the support she received from an administrative staff in her department:

Our academic counselor... coordinator, yeah. She is definitely always there for students, like if you ever need anything, she definitely knows what your strengths are and assigns you... I don't know, she's great. If there are any volunteering experiences, internships, any opportunities, she knows what your strengths are and if you fit well with them and she... she actually will talk to you and make the move, you don't have to go to her. So she, I think she's like definitely a big component of the Chemistry department at [*sic*].

Another participant also spoke positively about the support she received from members of her lab group:

There are people in my lab that I feel comfortable...like you know, if I have a bad day and I need to vent or you know, like just take a moment for myself, I know that they're available to provide me with that support and I feel comfortable talking to them and likewise they feel comfortable talking to me. I think that we try to find our own support among each other, like just meet regularly and talk about anything that is stressing us out, which is very important in graduate school.

**Limited or no mentorship/support from current faculty.** A large number of participants also reported that during their doctoral studies they interacted with faculty members in their program/department who provided limited or no support. One participant described his experience in the following quote:

I would say the role of my mentors has been like... the official, like they provide the research tools and just the lab overall. I just follow whatever, like I follow whatever it is he wants me to do, in terms of the like the path of the research. If he wants it to go one way, I'll just follow it, and yeah...that's pretty much, that's pretty much it. But in terms of support, other than that, than what is expected, I haven't received very much. So, it's more like what I just stated, just a lab and research equipment.

**Mentorship/Support from current faculty.** Although a large number of participants indicated having an experience in their doctoral program in which faculty gave limited or no support, half of the participants in this study also reported that they were able to obtain mentorship or support from faculty at their present institution. One participant enthusiastically described the support she has been able to obtain from her major professor:

He teaches us, and teaches us about academia and industry, and he basically learns what everybody wants to do and somehow he keeps it in mind what everybody wants to do. So, when things come up, he'll email us quickly like 'hey, you might wanna do this, if you're still trying to accomplish.' So he is very, very helpful.

**Mentoring/Support from faculty, peers, and/or program director of an academic enrichment program.** Some participants also indicated that they have been able to receive mentoring and support from various individuals associated with an academic enrichment program, including faculty, peers, and/or the director of the academic enrichment program. For example, one participant described the ongoing support she has been able to obtain from the directors of a fellowship program she previously participated in:

One of the co-directors, actually both, but mostly one of the co-directors, one of the people that were in charge of this fellowship, he became very... I became very close with him and confided in him. He was a person that always told me that if I have any issues or if I am not sure, I would be able to open up with him. Even until now, he has been a person that... even if it's once a year, but we stay in touch and has been someone that always was a source for me of confidence, or trust, or to get that motivation, and even if I didn't really believe in me or wasn't sure...he would be very honest with me, so yeah. And it's not just him, but others. Two others during undergrad really helped me in getting that confidence and applying to grad school.

**Mentoring from faculty or students of color.** In addition to the support participants were able to receive from individuals associated with an academic

enrichment program, three participants also reported that they have been able to obtain mentoring or support, specifically, from racial/ethnic minority faculty or students. One participant described how his peers of color have supported and motivated him to persevere through his doctoral studies:

Within the student body we come together and kind of support each other in that way, and talk about...you know not only academic issues, because sometimes the academic issues like we know what we have to do right now; we have to study and read and write, and we know what we have to do there. But, it's mostly for supporting the other part, you know, the personal part, the person that is here, not the, you know, not the nerdy guy (laughs). So the peers will come in there and kind of support me in that way, and encourage me to keep going, and remind me like 'hey you're here, you made it, you gotta keep going cause you gotta represent' and you know...we are trying to change the demographics in academia, you know, we don't see people with our skin color, or who look like us in positions of power or teaching, and we want to change that so we have to keep going.

**Mentorship/Support from previous faculty.** In addition to the previous responses, three participants also indicated that the mentoring and support they were able to obtain from former faculty (e.g., faculty from their undergraduate university) has served as a positive factor in their doctoral pursuits. One participant noted the following:

There were quite a number of professors that were very, were very helpful in the process of applying, or overall in the classes, that just really motivated me to like stay on track with science. So yeah, so professors I would say in those terms, like my undergrad professors, played a major role.

**Limited or no peer mentoring.** Three participants also spoke directly about their experiences with peer mentoring, noting that they had either limited or no peer support at their graduate institution. In the following quote, one participant described her frustration with the lack of peer mentoring available at her university:

I think I struggled a lot without having like an older person in my area that's here. I have had some people who were here, like in my first year, but they

graduated pretty shortly after, and there has not really been anybody to take their place. So that didn't... like when I have a problem or I want help or suggestions, I have to sort of go outside and ask people. I had to ask people who have already left the program to help and I don't really have someone that's here.

**Positive experiences with peer mentoring.** Three additional participants also described their experiences with peer mentoring. These participants reported having positive experiences in this area; for example, one participant expressed how peer mentoring has helped her overcome difficulties during her doctoral studies:

There are times where I feel that it's unfair or I'm just confused about the process because it's very vague, so getting advice from a student who has been in the program 3-4 years into it has really helped, helped me kind of understand where I stand or where I need to go.

The third probe asked participants the question "How has peer support been in your program?" Table 9 represents the six categories that emerged.

Table 9

*How Has Peer Support Been in Your Program?*

Categories	<i>n</i> (%)
Collaborative/Supportive environment	6 (54.54%)
Miscellaneous (e.g., small program, isolation, difficulties in developing relationships)	6 (54.54%)
Peer support from research group/lab	3 (27.27%)
Peer support from students of color in STEM	3 (27.27%)
Competitive atmosphere/limited peer support	2 (18.18%)
Lack of racially/ethnically diverse peers	1 (9.09%)

---

*Note.* N = 11, Total does not equal 12 (100%) because one participant did not provide an answer to this response category. Further, some participants endorsed more than one response category.

**Collaborative/Supportive environment.** Several participants (54.54%) reported that the peer support in their program/department was positive, describing the environment as collaborative and supportive. For example, one participant described her experience in the following quote:

Everyone's completely supportive of each other. There is not like a lot of competition like, 'I'm gonna get a paper done before you' or that's a goal, it's all about like 'oh you got that paper accepted? Congratulations! I'm working on this one what do you think?' There have been a lot of collaborative efforts, even across different areas, it's been great.

**Miscellaneous.** More than half of participants also provided a variety of responses, including answers related to the small program size; isolation; and difficulties encountered in building relationships with other individuals in their program, department, or university. For example, one participant recounted her experience with isolation "My first semester not doing too well in school...I kind of felt a little bit isolated from the rest of the individuals in my program; I didn't feel like I necessarily was, you know, like I made the cut or something."

**Peer support from research group/lab.** Three participants also reported that they received peer support from their research/lab group. One participant noted the following "Especially within like my advisor's lab, I'm pretty close to some of the students...and we...like we do provide a lot of support to each other and through the different activities we have to do."

**Peer support from students of color in STEM.** Three additional participants noted that the peer support they obtained came primarily from other students of color who were also in STEM fields. A participant expressed the positive impact of having support from other students of color in STEM in the quote below:

I'm [*sic*] of the Black Graduate Professional Student Association, so I get to you know... I have access to Black graduate students from all different departments, so it's one of those things where yeah we are in different you know specialties, but at the same time we are going through the struggle as being Black in a graduate program at a PWI... and so it's one of those things where we can still you know talk to each other, kind of support each other, help each other with that stress of our heads any time we feel like you know it's over bearing.

**Competitive atmosphere/limited peer support.** Two participants reported that their program/department had a competitive atmosphere and as a result, limited peer support. One participant explained his experience with having competitive peers:

I don't tend to hang out very much with them at all. I mean, they are nice and all, but you know... a lot of the times, you just kind of feel a competitive kind of like... I don't know, it feels like everybody is competing. So, it is kind of weird sometimes to kind of talk about what is bothering you and what is not, because you kind of feel like everybody is with... ready to talk about you behind your back, so it's kind of annoying.

**Lack of racially/ethnically diverse peers.** One participant indicated that their program lacked racially/ethnically diverse peers. Specifically, he noted the following "That is one thing that just... not bothers me, but it is kind of like there aren't any other Latinos."

The fourth probe asked participants the question, "Have other social support systems in your university, but outside your graduate program, been helpful during this process?" Participants' answers fell into five categories, as illustrated in Table 10.

Table 10

*Have Other Social Support Systems in Your University, but Outside Your Graduate Program, Been Helpful During This Process?*

Categories	<i>n</i> (%)
Organizations, associations, and student groups	9 (75%)
Academic enrichment programs/Fellowships	3 (25%)
Limited or no support within university	3 (25%)
Other university centers	3 (25%)
Miscellaneous (e.g., teaching program, desire to help peers due to sociopolitical climate, and friends)	3 (25%)

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Organizations, associations, and student groups.** The majority of participants (75%) reported that they obtained social support through organizations, associations, and/or student groups at their university. Specifically, participants cited being involved in cultural student organizations, associations for students of color in STEM, as well as the graduate student senate. For example, one participant described the benefits of being involved in a cultural association:

The Latino association has been very supportive, because we tend to talk about issues about being a person of color, of being Latino and being here in a White city, in a White institution, and how we navigate, and what we have to do, and how hard we have to work. So, it's more like a little kind of therapy circle, where we kind of like you know, like we understand we are different; we come

from different backgrounds and we ourselves know that we might be Latinos, but you know, I'm Mexican and there's Puerto Ricans and there's you know, Salvadorians, and things like that. We know our differences, but we know what brings us together is the perception that everybody else thinks that we're all the same in one group. So, that's supportive.

Another student also endorsed a similar sentiment regarding her involvement in an association for students of color in STEM:

The National Society of Black Engineers, they have speakers come in, talk to us about different things, whether it's our place in society as Black scientists or just being Black in general in, you know, a graduate program. They have opportunities to go to different conferences and recruit, and sometimes we just you know get together and just hang out. We, some of us, watched the Super Bowl last weekend (laughs) and let's see...just...just general what would, what would make us, you know, better people. Anything on a positive notion and sometimes, you know, even with the things that are going on with the police brutality and things of that nature. We had a discussion about that, so it basically encompasses our daily lives in our discussions among them.

**Academic enrichment programs/Fellowships.** A fourth of participants indicated that their involvement in academic enrichment programs or fellowships has served as a social support system. One participant described the support she was able to receive through such a program:

Through the summer predoctoral institute, I was able to meet people from different departments and even areas like humanities and social sciences as well. And we were able to sort of create a group of people who were also beginning a doctoral program, so there was a lot of bonding and it's always nice to have people outside the department that you can go talk to... to be like, how is it being in your first year, or being new to the program during the transition. And maybe provide to you a space where you can vent.

**Limited or no support within university.** A fourth of participants also reported that they had limited or no social support within the university, specifically, outside of their immediate department. For example, one participant expressed the following "Faculty from my graduate school, because they are not really... they are



just a part of the graduate Biomedical Science school, they have been pretty supportive; but other than that, not really.”

**Other university centers.** Other participants indicated that they were able to find social support through centers at their university. One participant described her experience seeking out cultural centers at her institution in the following quote “I did go and seek out the cultural centers that were at my university, and I was introduced to the director and you know, we really hit it off.”

**Miscellaneous.** Lastly, a quarter of participants also provided a variety of responses to this question. For example, responses included the benefits of being involved in a teaching program, a desire to provide social support to peers due to the current sociopolitical climate, and obtaining social support from friends in general. In reference to the desire to help peers due to the sociopolitical climate issues, one participant noted, “I guess that’s something that I do more... maybe to try to help out, rather than feeling that I need the support personally.”

The fifth probe asked participants the question “Has your program provided an academic curriculum that has been culturally relevant to you? For example, are cultural issues integrated into classroom materials, discussions, and illustrations?”

Table 11 represents the five categories that emerged.

Table 11

*Has Your Program Provided an Academic Curriculum That Has Been Culturally Relevant to You? For Example, Are Cultural Issues Integrated Into Classroom Materials, Discussions, and Illustrations?*

Categories	<i>n</i> (%)
Academic curriculum is not culturally relevant	12 (100%)
Limited inclusion	6 (50%)
Faculty, program, or department lack diversity and/or awareness of cultural issues	5 (41.66%)
Cultural material must be sought out on personal time	4 (33.33%)
Miscellaneous (e.g., teaching style, program discourages multicultural research, offensive remarks)	3 (25%)

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Academic curriculum is not culturally relevant.** All twelve participants reported that culturally relevant material was largely absent from their academic curriculum. Specifically, participants overwhelmingly indicated that their programs solely focused on core science content. For example, one participant expressed the following “Not in particular. Our classes are very much structured to math content, which sometimes can be hard, especially when you’re concerned about situations outside of math...they don’t really get addressed in the classroom.”

Another participant reported a similar concern “All of the rest of my courses, I cannot really say that I resonated culturally or society issues, because they always keep it very focused on the content of the discipline and that’s it.”

**Limited inclusion.** Although all participants reported that cultural material was not fully integrated in their academic curriculum, half of participants indicated that they were exposed to some cultural material in their program/department through ethics courses, workshops, or other short-term activities. One participant noted:

We were required to take a course that is called something like ‘Survival Skills and Ethics.’ And being there we would talk a lot about, at some point sooner or later, we would talk about grant writing—fine, that is not related to culture, but we would talk also about racial issues, or discrimination in science, or sexism in science, so in that sense, yeah. Specifically, in that course, we talked a lot about it and we brought a lot of examples. We opened up actually... it was very sensitive sometimes. Outside of that, outside of that semester in my first year in my spring semester, that was the only the course.

**Faculty, program, or department lack diversity and/or awareness of cultural issues.** A number of participants also reported that their program, department, and/or the faculty within their program were not diverse or lacked an awareness of the importance of multicultural issues. In the quote below, one participant communicated the frustration he felt due to his advisor’s lack of multicultural competence:

Even with my advisor... I’ll have, you know, we will butt heads when we’re discussing cultural issues within my research, where I’m all like ‘so we don’t really need control groups for what I’m studying, because I’m focusing on African Americans, an African American population’, so he’s like ‘Where is your control group? Where is your White control group?’ So it’s like, not necessary, no (laughs). So that’s my advisor and it’s 2017.

**Cultural material must be sought out on personal time.** One third of participants also noted that given that their program/department did not integrate multicultural content in their curriculum, seeking this type of knowledge had to be

done during the student’s personal time. For example, one participant indicated “The opportunities to become culturally aware are there, but you have to find them; so, it’s not given to us by the program.”

**Miscellaneous.** Participants also provided a variety of responses to this question, including encountering faculty with various teaching styles, being in a program that discourages research on multicultural topics, as well as being the target of offensive remarks. One participant shared his experience of being discouraged from pursuing multicultural research:

I’ve gotten some push backs, like they’ll say like ‘why would you wanna do that? Do you realize that it’s gonna be hard for you to maybe get a job and you’re gonna get a lot of push back, because you know, studying race differences and stuff related to culture, you know, seems a little... it’s not very welcomed in most departments’ and that’s what they tell me. So, they kind of tried to discourage me from doing it.

The sixth probe asked participants about the financial aid they may have received in their respective academic program. Table 12 represents the six categories that emerged from participants’ responses.

Table 12

*What About Financial Aid?*

Categories	<i>n</i> (%)
Doctoral program guarantees funding (e.g., teaching assistantships)	9 (75%)
Other sources of financial support (e.g., fellowships, scholarships, grants)	7 (58.33%)
Miscellaneous (e.g., teaching assistants are overburdened, program restricts outside jobs, adapting to financial hardship,	7 (58.33%)

financial support as a motivator, no undergraduate debt, previous financial aid hardships)

Financial support is not an issue	6 (50%)
Stipend is not sufficient	3 (25%)
Family stressors (e.g., difficulty supporting or visiting family)	3 (25%)

---

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Doctoral program guarantees funding.** The majority of participants indicated that their respective doctoral program guaranteed funding, primarily through teaching assistantships. For example, one participant explained how graduate funding operates in her program:

The program that I am in, they guarantee funding for all the time you're there, for like at least five years and then if you need to stay for longer than five years, it's dependent on, you know, your progress, but pretty much it's guaranteed.

**Other sources of financial support.** Over half of participants also reported that they were able to obtain financial support through other sources, such as fellowships, scholarships, and/or grants. One participant spoke directly about her experience receiving a fellowship "For two years, I have the fellowship and the fellowship pays for everything, except student fees, which are \$1,200 each semester. I get paid... I think like \$8,000 more than what a typical student would make."

**Miscellaneous.** More than half of participants also indicated a variety of responses. For example, some participants reported feeling overburdened as a graduate instructor, their program restricting outside jobs, or having no undergraduate debt.

Others spoke about how they adapted to financial hardships, as well as other topics.

One participant noted the following in regards to feeling overburdened as a result of her graduate teaching assistantship responsibilities:

You do discussion, class, and then you teach a lab. But after that, you also have to do a lot of grading. Sometimes I see my colleagues on Friday nights start...they start grading at 4 pm and then leave at 2 A.M. or 3 A.M. because there's just like not enough graduate students. So they are definitely being overworked, because besides being obviously working more than 30 hours a week on that 'supposed part-time job'...yeah they put in like more than 40 hours and I don't think that 20... \$21,000 a year is worth being exploited like that.

**Financial support is not an issue.** Half of participants also directly expressed that financial support has not been an issue in their program/department. One of the participants talked about how the financial support he received has been sufficient:

I don't have like, 'oh I can't make ends meet, I can't pay rent' or something like that, that has not happened. So yeah, so in that regard it has helped me because I'm not strained for most of the semester.

**Stipend is not sufficient.** Although a substantial number of participants indicated being guaranteed funding or experiencing no issues in regards to financial support, 25% of participants reported that the graduate stipend they received was not sufficient. In the following quote, one of the participants expressed her frustration with the insufficient stipend and the financial difficulties she experienced as a result:

The stipend is not enough and I make sure to set money aside, but that is not enough I guess in the context of the city that we are living. So, the same stipend in any other city, maybe it'll be totally fine and we wouldn't have been struggling so much, but students in here, not only me, and regardless of ethnicity—that's one of the issues, the city in which we are living in, it's very expensive, paying the rent and the supermarkets and all the stuff you need to survive. And a lot of people end up in here, even if they don't want to, a lot of people end up living with 2 or 3, or even 4 people, so they can pay less rent and they have more for other stuff.

**Family stressors.** A quarter of participants also reported experiencing various family stressors as a result of limited financial resources. For example, some participants indicated experiencing hardships associated with financial obligations to their families or not having sufficient financial means to visit their families living out of state. One participant described the difficulties he experienced due to family responsibilities and a limited graduate stipend:

I may be here, but because I have strong ties to my family and other financial obligations to them, a large part of my already small stipend is sent back. So I live with 3 roommates, just to get...just to have enough extra income so that I can send stuff home. So I made a personal adjustment so that I could, you know, be able to be here and still support my family with California prices back home. So that's been very challenging and it's been a continual stressor for me.

The seventh probe asked participants the question, "Have you participated in any academic enrichment programs (e.g., McNair Scholars Program, Minority Access to Research Careers, etc.) that have facilitated your success in your doctoral program?" Participants' answers fell into three main categories, as illustrated in Table 13. However, given the nature of the responses provided, the category "participation in academic enrichment programs had a positive impact" was further divided into six subcategories, including "promoted networking/lasting relationships," "served as preparation for graduate school," "provided mentorship and support," "increased interest in STEM/research," "financial support from academic enrichment programs," and "exposure to professional development opportunities."

Table 13

*Have You Participated in any Academic Enrichment Programs (e.g., McNair Scholars Program, Minority Access to Research Careers, etc.) That Have Facilitated Your Success in Your Doctoral Program?*

Categories	<i>n</i> (%)
Participation in academic enrichment programs had a positive impact	6 (66.66%)
Promoted networking/lasting relationships	5 (55.55%)
Served as preparation for graduate school (e.g., scientific thinking, publishing)	4 (44.44%)
Provided mentorship and support	3 (33.33%)
Increased interest in STEM/research	2 (22.22%)
Financial support from academic enrichment programs	2 (22.22%)
Exposure to professional development opportunities	1 (11.11%)
Miscellaneous (e.g., impact of student clubs, other influences for pursuing higher education, preparation for working in predominately White spaces, hardships in transitioning to another STEM field)	3 (33.33%)
No previous participation in academic enrichment programs	2 (22.22%)

*Note.* N = 9, Total does not equal 12 (100%) because three participants did not provide an answer to this response category. Further, some participants endorsed more than one response category.



### **Participation in academic enrichment programs had a positive impact.**

Over half of the participants who responded to this question indicated that their involvement in academic enrichment programs had a positive impact on their doctoral academic success. Specifically, responses to this category yielded various types of answers, which were further divided into six subcategories. The first type of response obtained was that participation in academic enrichment programs promoted networking opportunities, as well as the ability to develop lasting relationships. For example, one participant indicated the following:

It actually allowed me to be introduced to who is my current advisor now. He came in and spoke with us and basically (laughs) talked his way into having me in his Ph.D. program, that's what he did (laughs). But yeah, it really had a big influence and impact.

The second subcategory of responses specified that participation in academic enrichment programs served as preparation for graduate school. Specifically, participants reported that their involvement in these programs allowed them to develop their scientific thinking and academic writing skills early in their training. For example, a participant noted “For [*sic*], I think it really like... it really helped me in terms of like starting to think like a scientist and like with writing as a scientist. It started helping me like to prepare for those things.”

Other participants indicated that their involvement in academic enrichment programs was especially helpful in terms of providing them with mentorship and support. Here is one account “The people in that program were really invested, or at least in my experience. They get the people who want to be somewhere, go to where they need to go.”

Participants also reported that involvement in academic enrichment programs increased their interest in STEM fields and/or in conducting research. One of the participants shared how her involvement in the Ronald E. McNair Scholars Program served an important role in her decision to pursue a doctorate in a STEM field:

I wouldn't be in a Ph.D. program if it weren't for McNair; I didn't even know what a Ph.D. was before. So I came, I come from a very small undergrad where only bachelor's degrees were given. So, I don't have a lot of exposure for graduate degrees. So McNair actually like informed me as to what is a Ph.D., and what I have to do to get it, and what work I need to do to get one. So yeah, so McNair like I regard it as way up there in the reasons as to how I got here.

Moreover, participants also indicated that their involvement in academic enrichment programs was positive in terms of providing them with needed financial support. One participant described in detail how the financial support provided in these programs has benefited her:

Following the topic of money and financial aid, we cannot lie...actually it's interesting when this fellowship that I am in right now, the Neuroscience Scholars Program, they only give it to 15 fellows. But to the people that are very well qualified, but they cannot take them, they make them what they call 'associates.' But then to the fellows they made an interview and they asked 'what do you value a lot about this?' and we didn't lie, we said the money the financial aid portion is very critical for us. Especially for our program, we don't have that much help even if you want to go to conferences or to a course that is going to help your research. They either don't have the financial support, or they have some small grants, or general grants that are only for a few students, or you need to show that you are going to present and sometimes you cannot present. So ultimately, this type of stuff in our discipline is very key to your research, and how much you get that exposure, and how much you talk with other researchers in your field, and sometimes you can only have that opportunity when you go to a conference, or an award show, or something like that. And this program has allowed me...and that is the reason that I was really excited about getting it, because otherwise I think I would not have been able to do half of what I have been able to do.

Furthermore, another participant reported that involvement in academic enrichment programs provided her exposure to professional development opportunities, as illustrated in the following quote:

Especially in professional development, because I have other interests outside my research, and through this program I will be able to also go to workshops and get more support on techniques. For example, social media, or if I ever want to do a business, or if I ever want to dedicate more time for science writing because that is also another interest for me. So, it's not only focused on the research and through this program I have found that support or knowledge that they give to their students, learning about the other options that you have as a Ph.D. holder.

**Miscellaneous.** A third of those who responded to this question indicated a variety of responses. It is important to note that certain responses were relevant to the question asked, whereas others deviated from the presented question. For example, responses included the positive impact of participating in a robotics club, the various influences on pursuing higher education, internships serving as preparation for working in predominately White spaces, as well as the hardships experienced in transitioning to a lab in another STEM field. One of the participants described her rationale for selecting summer internships while participating in an academic enrichment program:

When I did get those internships, I made sure to go to schools that would look like the actual workplace, so that this way I had an understanding of 'okay, you know everybody is not gonna be on your side', or 'everybody is not gonna be looking like you look', or you know 'they might not agree with you' you know, 'they might not approach things the way you would.' So, that kind of you know, geared me up to what I would see moving up in rank.

**No previous participation in academic enrichment programs.** Two participants directly stated the reasons why they had not previously participated in an academic enrichment program. However, it is important to note that three additional

participants were not asked this question since they reported no previous involvement in academic enrichment programs in the demographics questionnaire. One of the participants who responded to this question noted the following “I feel like they have a lot less of those kinds of programs in Mexico.”

The eighth probe asked participants the question “What about support systems outside of school (i.e., family, religion/spirituality, or participation in professional associations)?” Table 14 represents the six categories that emerged from participants’ responses.

Table 14

*What About Support Systems Outside of School (i.e., Family, Religion/Spirituality, or Participation in Professional Associations)?*

Categories	<i>n</i> (%)
Family/Significant other	10 (83.33%)
Miscellaneous (e.g., support within program/department, pets, other peers of color, Fulbright community, limited connection to religious community due to cultural differences, faculty or opportunities in other departments, experiences with racism/ discrimination, personal qualities)	8 (66.66%)
Academic challenges not understood by family and/or friends	6 (50%)
Religious affiliation/Spiritual connection	5 (41.66%)
Friends	4 (33.33%)

Organizations/Professional  
associations

4 (33.33%)

---

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Family/Significant other.** A large majority of participants indicated that their families and/or significant others served as a support system in their doctoral educational journeys. Below is an account from a participant that described how the support from her family has motivated her to persevere in her studies:

My parents, every time I talk to them they say that they're proud of me. And you know, that motivation and that support is always been a major, you know, it's been beneficial to me to keep going and knowing how proud they are of me, because they didn't have these resources as they were growing up. They had to take, you know, the manufacturing jobs and things of that nature. So, just having their support.

**Miscellaneous.** Over half of participants reported a variety of responses to this question. For example, some of the answers included the benefits of being a pet owner, the support received from the Fulbright fellowship community, limited connection to a religious community due to cultural differences, negative experiences with racism and/or discrimination, support from other peers of color, among other topics. For example, in the following quote, one of the participants spoke directly about her difficulties connecting to her local religious community:

I don't go to church here as often as I used to before coming to graduate school, not necessarily because I have lost faith, but because it's just different culturally. So, I'm used to going to a Spanish mass and the setup is different, the people are different, like meeting families or friends like after mass. Here...I do go on Sundays, but it's not a Spanish mass, it's in English. So I feel like I have to learn...this might sound weird because I just said that I am bilingual, but when you are raised your whole life listening to mass in Spanish and then you go to an English one, it's like I didn't even know the name of the apostles and it's weird, and it doesn't really have much to do with the

translation, it was more like...I guess you know I was so used to going to mass and having the ceremony everything a certain way, so when I came here it was like a little bit strange for me. So you know, they do things differently and that's okay with me. So I would say I don't really have that connection with my religious community as I used to before moving to this part of the country.

Another participant noted that other people of color, in general, have been a support system for him "Just people who look like me have been supportive (laughs) and that's been the biggest thing."

**Academic challenges not understood by family and/or friends.** Although the majority of participants considered their families as a primary support system, half of participants also reported that their families and/or friends did not understand the unique academic challenges they experienced as doctoral students. One participant shared her frustration related to this topic:

With family it was kind of hard, because I mean they didn't go to grad school, so they didn't... they don't really understand the stress that's put on you as a Black female graduate student. So when I would come... like call to complain to them, they would say that you know... they're just like 'oh it's alright, you know you get everything anyway, so you're gonna figure it out' or, 'you're gonna get that fellowship.' And it's one of those things like 'no', like you don't even understand what I have to go through.

Another participant shared a similar sentiment:

I think it's really hard for parents, family, and friends to understand what you do, so they listen and they nod their head...but I think they don't understand the political side of being in academia and being more or less a graduate student, being the low man on the totem pole.

**Religious affiliation/Spiritual connection.** A subset of participants also reported that religion and/or spirituality served an important and supportive role in their lives that has helped them through their doctoral studies. Here is one account:

I still pray every night and I also pray before I get out of bed, so that does play a role in myself, I feel. Because anything I do, even if an experiment goes

wrong in the lab or doesn't go the way I expected you know, I just say to myself, 'if God allowed for that to happen that way, it's because there's a reason why, you just need to assess it and think about what you're going to do next.'

**Friends.** In addition to family and religion, a third of participants also noted that their friends played an important supportive role in their doctoral journeys. In the quote below, one participant described how the support she received from her friends has helped her to succeed in her studies:

My two best friends are gonna try to come and like try to support me. And since I've been here, my friends have come to visit me or done something really big for me for my birthday, every single year to try to just like yeah, to try to just get me to get out of like thinking so much about school and research etcetera, and just have a moment. So that has been very helpful. Also, my friends help me in terms of my spiritual life as well; like my two best friends, like we pray every morning together, early in the morning and especially about like...like they actually don't know about like... they have no idea about like my projects. They don't know the details, because they're not into science like that, but because we pray literally every morning, it's like you know they have an idea like 'oh I know today she is supposed to get like her results for that experiment she's been working on', so they'll say a prayer for me and stuff like that. So yeah, my friends are like very, very supportive, and always reminding me like, 'you can do this, just get off your butt.' Like sometimes they would give me wake up calls in the morning, or if I needed to study; like when I was still in classes they would call me to wake me up or like if I needed to take a nap or something, it's really like a community project of like getting me back up after my nap.

**Organizations/Professional associations.** Another third of participants also reported that they obtained support from organizations and/or professional associations. Here is one account:

I am part of an association that is for women in STEM, and I...I sort of co-created it with the girls from the SPI program that were from different STEM fields and that has been nice also because they can sort of see what issues other disciplines have and how they face it.

The second interview question asked participants to describe the various challenges they encountered in their respective doctoral programs. Responses to the

second question yielded eight categories, as illustrated in Table 15. The majority of participants responded to this question by providing a large variety of miscellaneous responses. Participants also cited having a negligent or unsupportive advisor, adjusting to a predominantly White institution, the structure of the program, overcoming failures, gaps in education, limited social support, and having a unique research focus area, as examples of the types of challenges they experienced in their doctoral programs.

Table 15

*In Your View, What Challenges Have You Encountered in Your Doctoral Program?*

Categories	<i>n</i> (%)
Miscellaneous (e.g., lack of diversity, competitive environment, school life balance, financial issues, anxiety, issues with lab group, coursework, politics in academia, offensive remarks, limited feedback on academic progress, being bilingual, cultural differences in academic environment)	10 (83.33%)
Negligent/Unsupportive advisor	3 (25%)
Adjustment to a predominantly White institution	3 (25%)
Structure of program	2 (16.66%)
Overcoming failures	2 (16.66%)
Gaps in education	2 (16.66%)
Limited social support	2 (16.66%)



Unique research focus

2 (16.66%)

---

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Miscellaneous.** A large proportion of participants reported a variety of responses in terms of the challenges they encountered in their doctoral programs. For example, some participants indicated that their program lacked diversity or that the competitive program environment was especially challenging. Others cited challenges related to being bilingual or difficulties associated with politics in academia, among other responses. In terms of lack of diversity, one participant noted the following “The graduate school body is not that diverse, like I said, I was the only minority person in the whole [*sic*] for many years.”

Another participant described the unique challenges he experienced as a bilingual student:

Being fully bilingual has also been a challenge. Because in my writing, oh my god, it’s just like you know, I don’t want to lose my Spanish. I speak Spanish at home with my family and that’s my primary language, but then I come here and then I have to code switch and that’s challenging, cause sometimes I’m struggling to write, I’m like ‘oh what’s the word.’ Like the other night, it took us, my roommates and I, we sat down and we tried to think of a word, it was ‘prevalence’, but we couldn’t think of it because we were stuck in Spanish--it took us about 20 minutes to figure that out, it’s kind of sad...but things like that have been difficult.

**Negligent/Unsupportive advisor.** A quarter of participants also reported that a challenging factor in their academic program was having an advisor who was negligent and/or unsupportive. Here is one account:

Getting help from them has been like pulling teeth, like sitting outside their office waiting forever to be seen, emailing them and not getting responses; I mean, that whole part has been so challenging that I just can’t wait for it to be

over. So definitely that has been difficult, because like this cannot be this hard, I'm like 'I thought we had all the support systems and guidance.'

Another participant shared a similar account regarding her doctoral advisor:

She didn't really want to support you know...give emotional support, talk with her. Her thing was if you're not talking about research, then you have nothing to talk to me about. So I didn't have an environment where I can, you know, release those feelings at the workplace.

**Adjustment to a predominantly White institution.** Another quarter of participants indicated that one of the challenges they encountered in their doctoral program was adjusting to being a student at a predominately White institution. One participant described her experience in the quote below:

I went to school in Boston and you know, it's like a very diverse city, and I went to college as an undergrad and it's like meeting people from every single country, interacting with all of them, and it didn't matter which person they were and you would always find someone who was not like you and who was like you, you know within the same room. Coming here...it was just different...it had you know, a lack of diversity and I didn't think that was going to be an issue but...I don't think it was a major issue, but it was something that if I was not someone with like a strong spirit, it probably would have crushed me.

Another participant also echoed a similar sentiment:

At times, I feel like my culture or my background has been a strength to drive me, but also a challenge because we say a lot here like, 'being in an institution that is not meant for us, so we have to adjust to their ways', and it's hard when we are very different.

**Structure of program.** A subset of participants also cited the structure of their respective programs as a challenge. For example, one participant stated:

It is very independent at least for my field...it's very independent, but at the same time I feel it's too loose or there's really no structure until maybe you're towards the end, when you're kind of already understanding what you need to do. But, the first two years were really hard because I really didn't understand...there was no like there was no level to know where you were, if that makes any sense.

**Overcoming failures.** Some participants reported that they used the failures they experienced in their doctoral program as an opportunity to grow, as well as the importance of staying motivated and focused despite the challenges that are encountered. Below is a participant's account:

Just getting up the next day and trying again, and learning that failing is not an option, and when you do, you know... look at it from a different perspective. So, I was getting at one point, I was getting a little tired of coming up with a whole bunch of topics, and they wasn't, you know, sticking... and I was like 'oh lord I'm gonna be in here another 4 years.' But just learning to just... to move on, and you know, try it again with the same persistence and the same energy.

**Gaps in education.** Certain participants also indicated that they had gaps in their previous education and noted feeling unprepared for graduate work as a result.

For example, one participant shared the following:

I think my education, the holes of my education in my earlier education, even in my earlier--I'm talking high school and elementary education, have shown...because like a big part of the first year, I felt like I was catching up to be just as prepared as somebody who has gone to a better school with more resources, you know. And I'm not trying to say that as an excuse, but the fact that I saw the difference, I was like 'oh my god, I am so unprepared.'

**Limited social support.** In addition to gaps in education, a subset of participants reported having limited social support. One of the participants explained the challenges she experienced in this domain:

Not even being able to have time to create a network, because although now I do have a network, but then I do wish I had more friends or more people. So, you spend a lot of time busy being a student and not talking to other humans outside of your class and your classmate is the only one there. So that was kind of an emotional aspect of being with a bunch of responsibilities and not having an emotional net...an emotional network to have that support.

**Unique research focus.** Lastly, two participants reported that their unique research area created challenges in their doctoral program. Here is one account:

I think my main challenge has been the fact that what I decided to study was super unique to my research area. It's... it's still a decently new area, but I don't think there's a lot of the professors who understand it. So doing the qualifying exam, getting papers out, you know... when I go present in front of people, I usually change the topic of what/how I'm describing it and or moving my topic all the time, and it doesn't... I don't get the self confidence in what I'm doing because I feel like I'm always changing it to like make other people happy where I could just...I should be able to just present on what I know and what I'm doing. But, I think one of the challenges is just not doing an area that's super popular, or super well known, but still having confidence in my work, in my research, so that I can finish up.

In addition to the second interview question, participants were probed with five further questions. The first follow-up question asked participants to describe their experiences as a person of color on campus. Table 16 represents the eight categories that emerged.

Table 16

*How Would You Describe Your Experiences as a Person of Color on Campus?*

Categories	<i>n</i> (%)
Feelings of not fitting in, belonging, and/or isolation	7 (58.33%)
Intentional or unintentional racial slights/hostile campus environment	6 (50%)
Lack of diversity	5 (41.66%)
Reframing negative events	3 (25%)
Linguistic challenges (e.g., accent)	3 (25%)
Miscellaneous (e.g., access to school resources, appreciation of challenges, being sought out due to racial/ethnic background, difficulty finding culturally	3 (25%)

familiar food)	
Diverse program or lab group	3 (25%)
Sociopolitical stressors	2 (16.66%)

---

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Feelings of not fitting in, belonging, and/or isolation.** Over half of participants reported feeling unable to fit in with their peers or lacking a sense of belonging with others whose racial identity or cultural background differed from their own. Participants also indicated feeling isolated within their respective programs. In the quote below, one participant shared his experience:

During the first year, in general, like I felt very out of place. When I started teaching the students, all of my classes were full of White people. Like, I looked out and was like, ‘great, this is gonna be interesting.’ So I always felt very distant, in the sense that ‘do I even belong here?’ So I had that whole Impostor Syndrome.

**Intentional or unintentional racial slights/hostile campus environment.**

Half of participants in this study disclosed that they had been the target of racial slights from individuals in their academic programs and/or characterized their campus environment as hostile. One participant shared his experience being the target of racial slights in the following quote:

I would tell them ‘yeah, I’m one of the few Latinos in the department’ and they would say ‘oh yeah, they must have needed a diversity quota, so they let you in.’ So they would congratulate me, but also kind of put my accomplishment down.

Another participant spoke directly about the hostile campus environment she experienced “Someone wrote ‘nigger’ on one of the boards in the classroom. Maybe two years ago there was a noose that was hanging up.”

**Lack of diversity.** A number of participants also directly referenced the lack of diversity at their universities, both in terms of students and faculty, as a challenge. For example, one participant stated the following “There really are no other Latinas that are in science. There’s probably, I can count them on one hand how many students I know that are females and that are in like Chemistry.”

Another student also shared her frustration with the lack of diversity, especially in terms of the faculty composition:

We only have one person... one faculty member of color on... in our department, well he is a Black man, that’s professor [*sic*], who’s actually retiring and I mean he’s 70 years old. So it’s one of those things where...when he leaves...who else will these people have?

**Reframing negative events.** Interestingly, a quarter of participants answered this question by indicating that they found it helpful to reframe the negative events they experienced. For example, one participant shared how she coped by reframing negative comments:

Not let things get to you and just understand that if someone says something negative to you, you just have to feel like it’s either because they are ignorant or they just really don’t know anything about you, so just don’t let it bother you, you know? And you just see a lot of that, but you just have to be strong and not let it get to you.

**Linguistic challenges.** Another quarter of participants also indicated that they encountered linguistic challenges. For example, some participants reported experiencing difficulties in communicating with others, as well as being the target of insensitive remarks due to their accent. Here is one account “Since the beginning, I

have gotten every comment from my accent and ‘what did you say?’ or weird faces every time that I talk.”

**Miscellaneous.** An additional 25% of participants also provided a variety of responses to this question. For example, some participants stated that they had difficulty finding food from their culture or experienced challenges associated with being sought out due to their racial/ethnic background. Below is a quote that better illustrates the latter challenge “They ask graduate students of color to do you know...be a part of a panel. They ask you to do a lot of stuff for the undergrad support system, so they seek you out because of your background.”

**Diverse program or lab group.** In contrast to the previous responses, a subset of participants reported that their programs, departments, or lab groups were diverse. One participant described how the diversity present in her department has impacted her “Everyone is different in my department; everybody’s coming from different parts of the world, so I feel like I’m a minority, but there’s other minorities there as well.”

**Sociopolitical stressors.** Two participants also shared that the current sociopolitical issues have created additional challenges. For example, one participant expressed the following:

When different situations happened, especially with like the shootings of different African American men by police officers, that was the worst moment... because, you know, there was no one that I worked with in lab or no one that worked within my building that I could go talk to about things. Or like, if I was feeling afraid or feeling, you know, any type of way, even about the recent events with the election...with all these things that are going on with the executive orders... I have a lot of thoughts about them.

The second follow-up question asked participants if they have ever felt isolated in their program, department, or institution. Three response categories emerged and the following section provides a description of each (see Table 17).

Table 17

*Have You Ever Felt Isolated in Your Program, Department, or Institution?*

Categories	<i>n</i> (%)
Have felt isolated in department, program, and/or institution	7 (63.63%)
Miscellaneous (e.g., program has international faculty, declined funding opportunities due to international student status, help seeking behavior)	5 (45.45%)
Have not felt isolated	3 (27.27%)

*Note.* N = 11, Total does not equal 12 (100%) because one participant did not provide an answer to this response category. Further, some participants endorsed more than one response category.

**Have felt isolated in department, program, and/or institution.** Over half of participants who responded to this question disclosed that they had experienced isolation in their department, program, and/or institution. One of the participants described her experience in the following quote:

I think I am definitely a little isolated in my program because... most people are great, a lot of the graduate students have been fun, but once again with being a Black female at the University of [sic] and studying in my like specific area, I've definitely like put myself in a very very narrow category... and so...I just already feel isolated more because my research area, and then being the only Black.



**Miscellaneous.** A number of participants also provided a variety of answers to this question. For example, participants' responses included being in a program with international faculty, funding opportunities being denied for international students, and seeking help from others. For example, one of the participants spoke directly about how her ability to seek help when needed has aided her to not feel isolated:

I think it's definitely my personality. Definitely, if I had another personality but in the same context, like if I was a very introverted person or did not have that self-motivation of going out there and seeking help, then I definitely would be very isolated.

**Have not felt isolated.** Three participants also reported that they had not felt isolated in their program, department, or institution. One of the participants explained that the ability to connect to other Latino students has helped her to not feel isolated:

I don't think I've ever felt isolated in any way. I mean, I am the only Puerto Rican there, but I'm not the only Hispanic there ...like [*sic*] is there and I know there are students in the Polymer program that are Hispanic, so it's nice to talk to them, being able to talk to them in Spanish once in a while, and stuff. I guess the people that I have met are like, 'oh, we love Puerto Rico' and I can like talk to them about my culture and stuff, but yeah... I've been able to make friends on an emotional and professional level. I always have someone to have lunch with and study with, so no, I haven't felt isolated.

The third prompt asked participants "Tell me about the gender/racial make up in your classes. How has this impacted you?" Table 18 represents the nine categories that emerged.

Table 18

*Tell Me About the Gender/Racial Make-up in Your Classes. How Has This Impacted You?*

Categories	<i>n</i> (%)
Imbalance in racial/ethnic composition (e.g., predominately White and/or Asian)	11 (91.66%)
Gender is balanced or increasing numbers of females in program	9 (75%)
Miscellaneous (e.g., previous gender imbalance, benefits of a culturally diverse environment, lab group is diverse, sexist mentality, lack of diversity has served as motivation or preparation, feeling isolated due to lack of diversity, and unsafe campus environment due to U.S. presidential election)	7 (58.33%)
Having to prove competence or pressure to represent gender/race	4 (33.33%)
Have adjusted to lack of diversity (e.g., negative impact has decreased)	4 (33.33%)
Experiences with implicit bias, being treated as inferior, or exclusion from study groups	4 (33.33%)
Limited cross-cultural interaction (e.g., students gravitate to others from similar backgrounds)	3 (25%)
Self-initiated actions to increase diversity and awareness (e.g., recruiting other students of color, doing workshops on implicit bias, or initiating classroom discussions)	3 (25%)

Imbalance in gender (e.g., more males than females) 2 (16.66%)

---

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Imbalance in racial/ethnic composition.** Over 90% of participants reported that their programs/departments were unbalanced in terms of racial/ethnic composition. Specifically, the majority of participants indicated that their programs were predominately White and/or Asian, as illustrated by the following quote:

In terms of the racial composition, it's still predominantly White. I guess... I would say a small percentage, maybe 10% are Hispanic. There is a very low amount of African American students. I feel like we have like maybe two or three in the whole program, and in math we probably have a large population of Asian students, so they are probably the more predominant group in the department. I guess we have also a group of students that are Middle Eastern, Indian, but it is much more on a smaller scale. I would say mostly them or either what we consider White or Asian.

**Gender is balanced or increasing numbers of females in program.**

Although participants indicated that there was an imbalance in terms of racial/ethnic composition, 75% of participants reported that their programs were gender balanced, or noted increasing number of females in their classes. For example, one participant noted "I think there's been, gender-wise, a good mix of females and males; there's a good 50/50, or even, there's even been times where there's more females than males." Another participant shared a similar comment by stating, "At least for my program, I would say they are doing very good. I think that last year there was more women accepted than men and that is really good."

**Miscellaneous.** Over half of participants provided diverse responses to this question. For example, participants' responses included experiencing gender

imbalance in their previous undergraduate institution, benefits associated with being in a culturally diverse environment, being part of a diverse lab group, and experiences interacting with individuals who have a sexist mentality. Other participants also stated that they reframed the lack of diversity in their program as a method to prepare for how the future workplace environment will be like or using it as a motivator to persevere academically. Further, others shared that they experienced isolation due to the lack of diversity and perceived the campus environment as unsafe as a result of the recent U.S. presidential election. One participant shared how she used the lack of diversity in her program as a motivator to continue with her doctoral studies:

It has definitely been like, on the top of like my influences of like pushing forward. Like, one of my long term goals is really to like, kind of change the face of STEM, in a sense; where there are more represented minorities in bigger places, like teaching our classes, within our classes. Like, just last weekend, like we had recruitment weekend. There were two African American females that were interviewing with us and I was a little bit shocked, you know, to see them; and they were kind of shocked, you know, that there were two, because now we have another Black girl in our program, and they were pretty shocked that there are two Black girls in the program. I want that to not be... be a thing; like, I don't want that to be like a thing where I'm shocked because 'Oh my gosh, there are like Black people that they are interviewing' and I don't want Black people being interviewed to look at me in the program and say like, 'Oh my gosh, they have Black students.' Like that shouldn't be a shock, it shouldn't be abnormal to see. Or, like not even just Black, but just like you know, if I see Hispanic or maybe Native women, that should be normal for me to like see, because there are... there are people out there. Like with my internship, I realized like there are so many of us out there, we are just all scattered and in different places. So yeah, I definitely think that that inspired me in a sense.

A participant also shared how the U.S. presidential election has impacted her sense of safety on campus "The main problem has sort of been that... I mean I have to say that with the upcoming elections, there's been some stuff more that has happened on campus that hasn't made the environment feel particularly safe."

**Having to prove competence or pressure to represent gender/race.** A third of participants also expressed that they had to constantly prove their competence to others or felt an unspoken pressure to represent their gender and/or race. For example, one participant shared how her double minority status, being a woman and a person of color, has required her to overachieve in order to prove to others her competence and place in the graduate program:

It's one of those things where you know, I would have to double prove or triple prove myself to make sure that they understand that I do understand what's going on. It's a man's world in their eyes; so, it's one of those things where they probably won't even take me seriously. So, it was one of those things where I had to figure out, you know, how do I go about making sure that people understand that, you know, I made it in just like you did, we filled out the same application. You know, we had to do the same things to get accepted into this institution. So, I feel like maybe I would probably have to do the same thing, and it's hard not to react, because it does piss us off. But, we can't, you know, we can't react because that's what they expect... they expect me to be the angry Black woman. So it's one of those thing where I'll just have to do extra and be an overachiever to prove that I do belong here too.

Another participant echoed a similar sentiment in terms of the pressure she felt to represent her gender:

There are two or three females in the classes I have taken. Sometimes there is sort of...we feel unspoken pressures...just because we feel the need to represent. I want to say maybe everybody feels like that, but it has generally been my case.

**Have adjusted to lack of diversity.** Another third of participants indicated that they have been able to adapt to the limited diversity of their programs/departments. Specifically, participants noted that although the lack of diversity at one point negatively impacted them, that with time they have been able to adjust to it. For example, one participant noted “In the beginning, racial make-up was

a big deal. Now, it's not that it's not a big deal, it's more that I got used to it. I know that this is just temporary.”

**Experiences with implicit bias, being treated as inferior, or exclusion from study groups.** Thirty-three percent of participants reported being the target of implicit bias. For example, participants indicated experiences in which they were treated as second-class citizens or were excluded from study groups due to their racial/ethnic background. One participant shared her experience in the quote below:

I remember once I was in an event of Halloween, because they were promoting it through the graduate student organization, and I didn't dress up and someone made a comment of 'what are you dressed up as? A sexy Latina?' Thinking that that was cool, but I was like, 'okay?' So that actually was a female that said that, not even a man, but she was from the United States. So, those sorts of things, I guess it's that classic implicit bias.

**Limited cross-cultural interaction.** A quarter of participants stated that they had limited cross-cultural interaction with other students, primarily resulting from a proclivity to gravitate towards peers of similar racial/ethnic backgrounds. Here is one account:

At lunchtime you see everyone from their ethnic or gender, well more ethnic background, eating together. They're always in a little group, even when we all socially go out. Like we start mingling all together, but then we all just separate to what we know...and I guess it's the same in the classroom. Like when you go to study with someone, or when you go to share your notes or your answers with someone, you are always going to lean towards trusting someone more from what you're comfortable with, with what you know.

**Self-initiated actions to increase diversity and awareness.** Twenty-five percent of participants also indicated that they self-initiated activities in their respective programs, departments, or institutions aimed at increasing diversity and elevating cultural awareness. For example, participants reported being involved in recruiting other students of color, volunteering to do workshops on implicit bias, or

starting discussions on diversity within their classrooms. One of the participants shared her experience as a student ambassador working towards increasing the student diversity in her program:

I am a student ambassador, so we actually, like I am an ambassador, so what that means is that we go to conferences and we try to recruit students and when I do that, I try to really reach out to those minority groups, people who look like me, Native Americans, and people with more disadvantaged backgrounds.

**Imbalance in gender.** Two participants reported a gender imbalance, noting that their programs had a greater number of males than females. One participant had this to say regarding the gender imbalance “I thought the percentages were high, but it’s actually like 30% female and 70% male, I guess...even the faculty.”

The fourth probe asked participants if they had encountered difficult dialogues on race/ethnicity, sexual orientation, disability, religion, social class, age, immigration, or gender in their classrooms or within the lab setting. Table 19 represents the five categories that emerged.

Table 19

*Do You Encounter Difficult Dialogues on Race/Ethnicity, Sexual Orientation, Disability, Religion, Social Class, Age, Immigration, or Gender in the Classroom or Lab Settings?*

Categories	<i>n</i> (%)
Miscellaneous (e.g., student community at university is open and progressive; advisor, staff, and/or lab group are open and share views on diversity issues; university appears to be open to sexual minority students, but it is not; faculty and	9 (75%)

---

administration do not advocate for minority groups; heightened awareness of racism due to research focus; and students critical of faculty of color)	
Difficult dialogues occur, however primarily outside the classroom setting (e.g., with lab group, peers, or through training workshops)	6 (50%)
Witnessing or being the target of offensive remarks, underestimation by peers due to race/ethnicity, and/or social exclusion	5 (41.66%)
Have not encountered difficult dialogues on those topics	3 (25%)
Current sociopolitical issues have created a tense lab environment	2 (16.66%)

---

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Miscellaneous.** The majority of participants provided a variety of responses to this question. Specifically, responses included the university student community being open; having an advisor, lab group, and/or staff that are open and share similar views on diversity issues; the university appearing to be welcoming of sexual minority students when in reality it is not; faculty and administration failing to advocate for minority students; having a heightened awareness of racism due to research area; as well as experiences in which other students were unfairly critical of faculty of color. One participant described how having an advisor with similar views on gender and race has impacted her “My advisor has been more of a one-on-one, and she at least has



been very open. She shares many of my opinions on gender and on race and we haven't had any problems communicating about that sort of topic."

Another participant shared an experience in which she witnessed her peers unfairly criticizing a faculty of color:

There's been like an instance, like during my first year. I do remember like someone saying to me, like I remember we did have like an African American faculty who covered a lecture, and I noticed that like most of the students' responses to his lecture were very negative...and he actually never like taught again. Like some of the students were like pretty upset that he didn't go through everything in detail, but I mean the class is only like an hour. Actually, not even an hour, it's like 50 minutes long and so he couldn't cover... he had a really big topic and he spent some time on some certain things that he felt were the most important. This was his first time giving a lecture, he made that... made that clear in the first place. And you know afterwards, I guess when we started the exam as well, like they were really upset about his questions. But I felt that it was a little bit unfair, because that happens often; like with a lot of the other lecturers within our classes, like they don't get to all the material and they're not clear about what is gonna be on the exam, and yet, I didn't feel like it was a big deal like with other people. But, with the African American faculty member, I felt like...I don't know; I personally felt like his color had something to do with their response to his teaching. I felt like his teaching was pretty decent, and I mean at the end of the day we are in graduate school, so things that are not covered like specifically, you might still be responsible for it...like it's been a pattern so far, by the time he taught, it was like this is like established. So this is a pattern that like even if they don't go over it in detail, it could still show up.

**Difficult dialogues occur, however primarily outside the classroom setting.**

Half of participants indicated that they engaged in difficult dialogues; however, primarily outside the classroom setting. Specifically, participants reported that these dialogues occurred within their respective lab groups, with other peers, or during training workshops. Here is one account:

In the classroom it's really unlikely that anything like that would ever occur, just because it's very common to basically sit in class, the professor talks to you, but for the most part we don't address those sorts of issues in the classroom. We have had some training in difficult conversations about bias or gender, and that's when it has happened. So...but it has been more in that

general training setting that maybe those conversations have happened, rather than in the classroom and stuff.

**Witnessing or being the target of offensive remarks, underestimation by peers due to race/ethnicity, and/or social exclusion.** A number of participants disclosed that they witnessed or were the target of offensive remarks, experienced social exclusion, or were underestimated by their peers due to their racial/ethnic background. In the following quote, one of the participants shared an experience in which she witnessed a visually impaired peer being the target of offensive remarks:

There's someone in my lab who is visually impaired and people make fun of him all the time for being blind, when he's not even blind, he's just visually impaired. Like he can see, so yeah. I've heard a lot of criticism towards him, but he's really smart and works really hard. They don't make fun directly... indirectly. I guess... so we had a t-shirt competition for the [*sic*] department and he made a design, and when people found out that he made the design they were all like 'oh my gosh, how did he make that?! Did he have to like squint really hard at the screen to like design it?' and I'm like 'c'mon!' So stuff like that is just... also like there was a typo in the design he sent, he spelled 'language' wrong and they weren't going to tell him because they were like 'oh well... yeah we don't want him to win and well he should've squinted harder to see the typo' and I was like 'yeah, I'm gonna tell him', so stuff like that.

Below is another account:

We have a hospital on our campus and I was doing a rotation in the hospital; like one of my research rotations during my first year was in the hospital and so I have my hospital ID, I have a hospital decal on my car, and there was like a hospital security who was like in a SUV next to my car when I was parking. So I didn't pay any mind to it, because I was like rushing to go to class. My class is a little bit away from the hospital, like it's a couple buildings away from the hospital, and so I'm rushing walking to class, and I hear someone like 'excuse me, excuse me miss, excuse me' and I'm like... I assumed somebody was gonna ask me for directions, so I didn't pay mind, but the person kept saying excuse me, so I finally turn around and I see the same hospital security in their SUV calling out to me. So I'm like 'yes?' and she's like 'ma'am, did you just park in the hospital parking lot?' and I'm like 'yes, I did' and she was like 'do you even work at the hospital?' and I was like 'yes' and she was like

‘well, you are walking in the wrong direction’ I was like ‘I have class, I’m a grad student’ and she was like ‘yeah, okay well do you have like a badge?’ and I pulled out my badge before she even said it and she was like ‘oh, oh, okay, okay, yeah you know I just needed to double check’ and I was like ‘have a good day’ and I just left... and I was like, you know, that’s really no excuse because you were parked literally next to my car... you could have easily just looked at my decal on my car and had seen like obviously I work here.

**Have not encountered difficult dialogues on those topics.** A quarter of participants indicated that they have not encountered difficult dialogues in their classrooms or lab settings. One participant noted the following:

No, honestly it really hasn’t. I think the issues that more or less come up is the treatment of graduate students, as in general as a group versus like the faculty, and how there really is no, you know, financial support in terms of like the university. Like we don’t, they basically don’t fight for graduate students to get, you know, higher wages or like you know those social issues of graduate students as a whole, like those are the kind of things that are talked about, not individually like culturally, like ‘oh, you know these groups of people aren’t being paid attention to’ or things like that. It is more like the graduate student population as a whole; those types of issues like parking and health insurance, you know things like that.

**Current sociopolitical issues have created a tense lab environment.** Two participants also reported experiencing a tense environment in their respective labs due to the current sociopolitical climate. Here is a participant’s account:

When the whole campaign last year happened, one of my lab mates is very... I guess her... her real side started showing (laughs) and she started calling undocumented immigrants ‘illegals’ and racial slurs towards our past president...it’s just...so it does make for a very tense environment.

The fifth prompt asked participants “As a person of color have you experienced behavior or language that has made you feel excluded, slighted, or uncomfortable (i.e., racial microaggression)?” Table 20 represents the three categories that emerged.

Table 20

*As a Person of Color Have You Experienced Behavior or Language That Has Made You Feel Excluded, Slighted, or Uncomfortable (i.e., Racial Microaggressions)?*

Categories	<i>n</i> (%)
Yes	8 (72.72%)
Miscellaneous (e.g., methods used to cope with racial microaggressions, support from people of color in the department)	4 (36.36%)
No	3 (27.27%)

*Note.* N = 11, Total does not equal 12 (100%) because one participant did not provide an answer to this response category. Further, some participants endorsed more than one response category.

**Yes.** The majority of participants who responded affirmatively to this question indicated that they had previously experienced behavior or language in their academic programs that made them feel excluded, slighted, and/or uncomfortable. One participant shared her experience:

For example, sometimes you are just eating food and they would ask you like ‘what are you...,’ I had someone ask me what I was eating, and I said pasta, and they said ‘shouldn’t you be eating a burrito?’ And I was like, well, I’m Puerto Rican and even if I wasn’t...that is sort of not cool.

Another participant shared a similar account:

People would say, ‘oh you are so such a smart cookie’ and I’m like ‘and your reference to? Because I wouldn’t be smart or what?’ but you know, they would say something and they are like ‘oh you’re such a smart cookie’ and why do you have to reinforce that with me only and nobody else? I heard other people

... speak, but with me, you have to say that? So to me, I see some undertones of like, because of what I look like that you wouldn't expect that from me.

**Miscellaneous.** A number of participants also provided a variety of responses to this question. Specifically, answers included using distinct methods for coping with racial microaggressions, as well as receiving support from other people of color in their department. One participant explained how she has learned to cope with the racial microaggressions she experiences in her program:

I mean, it gets old. At first you wanna prove yourself and you start telling them like 'no, I am in, I'm qualified. I wouldn't be... I had to go through the same selection process as you did.' I even had to like go through... the only reason I have a fellowship is because I decided to go the extra mile; like I decided to apply for grad school, apply for other things, and like ask for other things... and like just proving that. I used to like, try to prove myself and try to defend myself, but now I just kind of laugh and shake it off.

Another participant shared how receiving support from other people of color in the department has impacted her:

Luckily, having other Black people in our department, you know, we can come to them and complain to them about, you know, things that were going on. Having professor [*sic*] on my side also helped, because we would come to him about the problems and he would actually, you know, bring up those problems in, you know, some of the faculty meetings and stuff like that. So, it was one those things where we were going through it, but we also at least had somebody who was there who could, you know, help make sure the rest of the department is aware of what's going on.

**No.** Three participants indicated that they had not experienced any behavior or language that made them feel excluded, slighted, and/or uncomfortable in their academic programs. For example, one participant stated the following "I really haven't, to be honest. I think I've had a good experience. Nobody's really talked to me in a way that made me feel uncomfortable."

*Research Question 2: What is the impact of multiple social identities on the educational experiences of STEM doctoral students of color?*

To answer this research question, participants described how their various social identities have impacted their doctoral educational experiences. The question yielded four response categories. Specifically, the majority of participants reported that their social identities have served as motivation, empowerment, and/or have aided their academic achievement. A large proportion of participants also provided a variety of miscellaneous responses to this question, including the impact their disability or immigration status has had on their educational experiences. Participants also reported difficulties relating to others, feeling isolated, and/or challenges in navigating friendships. The rest indicated that their sexual orientation and/or gender did not have a negative impact. Table 21 provides a breakdown of this information.

Table 21

*In Your View, How Have Your Various Social Identities Impacted Your Doctoral Educational Experiences?*

---

Categories	<i>n</i> (%)
Has served as motivation, empowerment, and/or has aided academic achievement	6 (50%)
Miscellaneous (e.g., emotional impact of financial constraints, pressure to represent gender, impact of immigration status, impact of disability, impact of intersectionality, privileges associated with gender, gaps in academic knowledge, social	6 (50%)

---

identities have not had an impact,  
impact of faith practices,  
differential sensitivity of sexual  
orientation versus race)

Difficulty relating to others, feeling isolated, and/or navigating friendships	3 (25%)
Sexual orientation and/or gender have not had a negative impact	2 (16.66%)

---

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Has served as motivation, empowerment, and/or has aided academic achievement.** Half of participants reported that their social identities were a source of motivation, empowerment, and/or have aided their academic achievement. For example, one participant shared how her background has motivated her to move forward in her studies:

They impacted me to keep moving forward because this is something like very, this is unknown territory for people like where I come from. My parents didn't go to school, like they didn't go to higher...they didn't go above you know high school level except for my father, he got like an associates. Then coming from a city where everybody just kind of lives their life, works you know 9-5 jobs, doesn't really, you know, look forward to having families and, you know, that type of lifestyle, like I just...I knew that I like things that were different... like I wanted a different life and being from the background that I have, it's kind of motivated me to keep pushing, because I feel like people ask me, like back home, like 'how's it going? What are you doing', so I feel like other people kind of are living through me and my experience. I know my parents are for sure, so I think it's been a positive thing with the way how I identify myself, yes it's been a positive experience in unknown territory, and I get to share it...I get to share it with my family.

Another participant spoke directly about how her various social identities have aided her in various facets of her doctoral studies:

That diversity has been something that has definitely helped me, all the way from research to understanding from a personal perspective. Not only in theory, but also to engage with the communities of [*sic*], and therefore my research is more facilitated. It has helped me in many ways, even with people from the public schools, etc. So, I love that my background really has helped me in here and that ironically it ended up being related to my research (laughs).

**Miscellaneous.** Half of participants also provided a variety of miscellaneous responses to this question. For example, some responses described the impact of a participant's immigration status, disability, as well as the intersectionality of distinct social identities. Other answers focused on the pressure some participants felt to represent their gender, financial hardships, gaps in education, among other responses. One participant spoke directly about his intersecting identities in the quote below:

I constantly will remind people like, 'oh you know, I know you guys tell me that I need to be very lucky that I'm here, and it's all great, but you guys don't realize that I got all these labels. I got one of an immigrant, I'm Mexican, I'm gay, I'm disabled, so I got like, I got all of this and it creates an interesting intersection that makes for a good time' (laughs); because, it definitely presents different challenges.

Another participant spoke about the pressures she experienced to represent her gender "My gender has impacted me a lot, just because I really felt this sort of pressure to represent my gender in undergrad, and that didn't really change when I came here."

**Difficulty relating to others, feeling isolated, and/or navigating friendships.** A quarter of participants also reported that their various social identities made it difficult to relate to others, caused them to feel isolated, and/or created challenges in navigating friendships. In the following quote, one participant described the difficulties she experienced in latter domain:

Being Black... I sort of had to like, not tone down who I am, but I'm definitely like doing the whole like, 'two different masks.' I hang out with my Computer



Science friends and most of them are White, so I don't really try to talk about certain issues with them, or bring up too many problems, and maybe I would just joke around or talk about that when I do hang out with my non-White friends for the most part. And it's like... I do tread two lines and I do have like three different groups of friends because of this...and I just try to make sure that everybody's happy and I don't like push too far with different groups. I definitely have to like tread this line still and that can be tiring at points.

**Sexual orientation and/or gender have not had a negative impact.** Two participants stated that their sexual orientation and/or gender did not have a negative impact on their educational experiences. However, it is important to note that both of these participants were heterosexual and male. One participant noted the following “In terms of sexual identities, no issues whatsoever.”

In order to obtain more information regarding the individual impact of social identities, participants were probed with seven further questions. The first follow-up question asked participants to reflect on how their gender has impacted their educational experiences. Six categories emerged from participants' responses (see Table 22). The majority of participants' answers focused on methods used to cope with sexism, as well as a variety of miscellaneous responses such as the importance of increasing the visibility of women in STEM, among others. A subset of participants also described the positive impact their gender has had, the advantages associated with being a male, experiences in which they were disrespected due to their gender, as well as specific challenges encountered from the intersection of race and gender.

Table 22

*What Has Been the Impact of Your Gender?*

Categories	<i>n</i> (%)
Methods used to cope with sexism (e.g., importance of being assertive, learning strategies from others)	3 (33.33%)
Miscellaneous (e.g., increases the visibility of women in STEM, few issues since majority of students are female, expectation that women must stay submissive and silent, and no impact.)	3 (33.33%)
Positive impact of gender (e.g., facilitates connection with others, shapes thinking)	2 (22.22%)
Advantages due to male gender	2 (22.22%)
Experiences being disrespected due to gender	2 (22.22%)
Specific challenges due to intersection of gender and race	2 (22.22%)

*Note.* N = 9, Total does not equal 12 (100%) because three participants did not provide answers to this response category. Further, some participants endorsed more than one response category.

**Methods used to cope with sexism.** A third of participants who responded to this question stated that they resorted to different methods for coping with the sexism they experienced in their doctoral programs. Specifically, participants underscored the importance of being assertive/speaking up, as well as learning coping strategies from others in the field. Below is a participant’s account:

As far as gender goes, I feel like we are still... like you know, as women, we are still minorities. Like, we are still a pretty big minority in STEM. So, I do feel like sometimes men are not... I don't know, like it's a little difficult to... I feel like you have to project more, you have to like over assert yourself.

Another participant explained how she has learned sexism coping strategies from other women in STEM:

I have gone to several women in science organizations where professional females who have been in the field and have been surrounded when things were like, one woman in a lab full of 4000 males kinda thing, and they have like told us the strategies they used and stuff. So getting that support has been really important in dealing with how men think of us within the sciences.

**Miscellaneous.** A third of participants provided a variety of answers to this question. For example, responses included the importance of increasing the visibility of women in STEM, the positive aspects of being in a program with a predominately female student body, experiencing no impact due to gender, as well as encountering individuals who expect women to be submissive and quiet. In regards to the latter response, here is what one participant had to say “Where I kind of felt it again was, I guess they think that as a female we're supposed to stay silent and you know stay submissive to whatever the situation is or whatever comes up.”

**Positive impact of gender.** Twenty-two percent of participants indicated that their gender helped in building a connection with others, as well as shaped the way they think about certain topics. One participant shared how her gender has impacted her in a positive way:

I feel like the way that my advisor talks to me, I can tell like he really appreciates me as a person because there's been people that he's come across that he's like kicked out of his lab, because he doesn't like them. Even though I might not be, you know, a very....because, you know, there are these students that are very very bright and are always working and always producing results and of course advisors want those types of students, but there's also the types of students that keep...they want to bring like life to the lab in a way, to have

this...you know people...to have that person who works with everybody, to make things like flowing right, so I feel that women do that. I like, I notice that in myself and I notice that in some of my friends that work in these labs, they have this like colorful personality to them that makes, makes working there a positive experience whichever lab they're in.

**Advantages due to male gender.** Two male participants also stated that they have experienced advantages in their programs as a result of their gender. For example, one of the participants spoke directly about his male privilege:

You could say that it may have been easier for me...just having probably less things to worry about, especially image wise or, you know, sometimes people doubting more maybe your abilities, it hasn't been...I guess...something that I've had to deal with. So I mean yeah, I guess it's been good... in a sense like most of the time I don't really think it's an issue for me.

**Experiences being disrespected due to gender.** Conversely, a subset of female participants shared that they had been disrespected in their academic programs due to their gender. Here is one account:

That's happened to me a lot of times, where I would be saying something and participating in a discussion and someone will, especially a guy, will like cut me off and just start talking and pretty much like build off of my idea and then they are credited, like all of the credit. Like that has happened often.

**Specific challenges due to intersection of gender and race.** Two participants also reported the specific challenges they experienced resulting from the intersection of their race and gender. One participant described her experience in the quote below:

It is difficult because as an African American woman, we are already like immediately labeled as being aggressive or being like too loud, etcetera. And so like for myself... I'm pretty quiet and I feel like part of that has to do with like, I don't wanna fit that stereotype where I'm just that loud Black girl and blah blah blah. But like at the same time, you know, it's pretty difficult to not speak up...and I think I kind have to try to be like 'okay, well hopefully me speaking up or me interrupting this person who just interrupted me doesn't classify me as the, you know, the angry Black girl' but at the same time, it's like I want my opinion to be heard, because I was talking first.

The second follow-up question asked participants how their race/ethnicity has

impacted their doctoral educational experiences. Three response categories emerged from participants' responses (see Table 23).

Table 23

*What About Your Race/Ethnicity?*

Categories	<i>n</i> (%)
Positive impact (e.g., served as motivation, shaped self-concept, ability to share culture with others, institutions value diversity)	5 (50%)
Miscellaneous (e.g., no experiences with racism, cultural differences with appropriateness of workplace attire, regional differences in training and preparation, pressure to represent students from undergraduate academic institution, coping with racism, challenges from intersection of culture and field expectations)	5 (50%)
Challenges due to racial/ethnic background (e.g., difficulty connecting with others, combating stereotypes, assumptions regarding immigration status)	4 (40%)

*Note.* N = 10, Total does not equal 12 (100%) because two respondents did not provide an answer to this response category. Further, some participants endorsed more than one response category.

**Positive impact.** Half of participants who responded to this question indicated that their race/ethnicity has had a positive impact on their doctoral educational experiences. For example, participants reported that their race/ethnicity served as

motivation, shaped their self-concept, provided them the ability to share their culture with others, or stated that their institutions valued diversity. In terms of race/ethnicity serving as a motivator, one participant had the following to say:

I don't know whether you heard about the study that was done where kids were asked to draw a scientist and they pictured a White man with geeky classes, with an ugly wife, and a lab coat on.... so (laughs) I am none of those. So, it's just, it's just about allowing people to see...and that's just with anyone, allowing them to see a different perception of a scientist.

Another participant described how her racial/ethnic background has shaped her self-concept:

I would definitely say it turned it for the better. In the sense of, I started realizing you know, at the end of the day, every day I wake up I'm gonna be a Black woman. There's nothing that can change that unless I, you know, do what Michael Jackson did (laughs). So, it was one of those things where I had to learn how to love myself, understand what my strengths were, understand what my weaknesses were, and how do I fix that. Fix it in the sense of, at the end of the day I still should be respected as a student here, you know, just as my other counterparts are. And making sure that I keep on force of that, because again, I'm gonna have to deal with the same stuff when I get into the actual workplace, when I get into my career, because again, I'll probably still be a minority wherever I go. So, it's impacted me in the sense of now coming to understand that who I am is who I will always be. There are always areas for growth, but at the end of the day, I know who I am.

**Miscellaneous.** Half of participants also provided a variety of miscellaneous responses to this question. Responses included not experiencing racism, cultural differences in terms of the appropriateness of workplace attire, methods used to cope with racism, and regional differences in educational training and preparation. Participants also shared that they experienced pressure to represent students from their previous undergraduate institution and experienced challenges resulting from the intersection of culture and academic field expectations. In the following quote, one participant spoke directly about the challenges she encountered from the intersection

of her cultural background and what was required of her to succeed in her academic discipline:

Being a Caribbean American, I feel we kind of grow up, especially as like women, we kind of grow up kind of always allowing men to be, you know, ahead of us; or like, you know, to kind of like stroke their ego or to kind of just be more quiet compared to them. And so that character is like something that I have come to dislike so much as I'm engaging more in science, because I feel like it... it kind of just sets me back. Like, it's not natural for me to just interrupt a man who's speaking, you know? Like, I didn't grow up seeing that and like I always saw the opposite of that, unfortunately. But, it's something that is like...you need to do this to get forward in your research and really build, and to get ahead in your career you need to over assert yourself, etcetera. And I feel like you know...it just kind of goes back to like even being just African American, not even Caribbean American. Just sometimes I feel like I have a 'slave mentality' about certain things; whether I'm like, you know, I'll be walking somewhere and I'm like, I might like look down or something, or like when I'm walking, or I might not speak up as much when I am talking to people whatever, or not speak unless I'm spoken to, and that is not typical. In the African American community we call that like 'slave mentality.' And it's like... this is not the place and the field for that... and for you to try to thrive. So that has been like my little sort of...that has been like the kind of internal struggle for me and things that I have been trying to work on and get past.

**Challenges due to racial/ethnic background.** Forty percent of respondents also disclosed that they experienced challenges due to their racial/ethnic background. For example, participants reported instances in which it was difficult to connect with others, having to combat stereotypes, or experiences in which other individuals made assumptions regarding their immigration status. One participant shared his experience in having to combat stereotypes in his doctoral program:

I think that a lot of people have a different expectation or schemas of what somebody, a Latino or a Mexican can achieve; even though they don't flat out say like 'wow, you're lazy,' it seems like that general stereotype is in their attitudes and when I do something and they're very, definitely surprised that I can do it.

The third follow-up question asked participants what has been the impact of

their social class in their doctoral educational experiences. Table 24 provides a summary of the five categories that emerged from participants' responses.

Table 24

*What Has Been the Impact of Your Social Class?*

Categories	<i>n</i> (%)
Socioeconomic status has been beneficial (e.g., financial improvement since starting graduate school, ability to save up money)	4 (36.36%)
Challenges due to socioeconomic status (e.g., additional stressor, limited access to schools with strong science curriculum)	3 (27.27%)
Limited negative impact or no impact of socioeconomic status (e.g., program provides funding, stipend is acceptable)	3 (27.27%)
Ways of coping with financial hardships	2 (18.18%)
Future improvement in economic status serves as motivation	2 (18.18%)

*Note.* N = 11, Total does not equal 12 (100%) because one participant did not provide an answer to this response category. Further, some participants endorsed more than one response category.

**Socioeconomic status has been beneficial.** The majority of participants who responded to this question reported that their socioeconomic status has had a positive impact. For example, participants noted that since starting graduate school they have experienced an improvement in their financial status. Other participants mentioned



that being in a doctoral program has given them the opportunity to save up money.

Here is a participant's account:

I came from a family that my mom was a single mom working at Family Dollar. I have a sister and just me, and pretty much the three of us really struggled really hard to pay rent, so it was hard. Like I said, I had multiple jobs to be able to afford college, it was hard. So yeah, when I came to graduate school and heard people complain, you know, about how their salaries were and things like that, but because of what I had experienced before coming to grad school, that actually was an improvement for me and I am sorry to say it but I guess it's just, you know, what are you comparing it to. I come from a very poor background, I come from my mom...my mom never took any government assistance, but she...we were barely making it and when I came here, earning a little bit over \$30,000, I was like good, great (laugh)!

Another participant shared a similar experience:

When I was an undergrad, I really didn't have any money. So being a grad student, even what people consider to be a meager salary, I can make a lot out of it. It is actually pretty great, considering that I can go out if I want or I save more money so... so in that regard it has affected me in a positive way, considering I come from a worse position when I was in undergrad.

**Challenges due to socioeconomic status.** In contrast to the previous response category, a subset of participants indicated that their socioeconomic status presented challenges. For example, participants reported that their socioeconomic status created additional stress and previously limited their exposure to schools with a strong science curriculum. In the following quote, one participant explained how her socioeconomic status while growing up impacted her academic development:

I feel like my socioeconomic status before being independent was already kind of like a setback. I feel like if I went to better schools... I had pretty good opportunities even at the schools that I went to, but I feel like if I went to even better schools with even stronger science programs, it would not be as difficult for me. Or like you know, I would be so engaged in science, I would be a lot more confident.

**Limited negative impact or no impact of socioeconomic status.** A number of participants also reported that their socioeconomic status did not have a negative

impact, or had minimal impact, on their doctoral educational experiences. Specifically, participants noted that their programs provided them funding and/or that the stipend they received was acceptable. For example, one participant noted the following “Because they provided funding for the...for at least the whole program up to six years, I think that wasn’t a big issue for me.”

**Ways of coping with financial hardships.** A subset of participants spoke about the various methods they used to cope with financial hardships. Here is one account:

Me being from the city, like we’re like natural born hustlers. Like, we figure it out, we tutor you know tutoring \$20 an hour, selling stuff you know...like things like that. I mean, that’s just how I try to make ends meet.

**Future improvement in economic status serves as motivation.** Two participants indicated that the prospect of improving their economic status has served as motivation to persevere in their doctoral studies. One participant explained:

I think it allows me to be able to tell, to tell other people that, you know, you work...you work hard now so that you can play later. And though I’m not making as much money as I, you know, like as of right now, that definitely (laughs) will change once I graduate.

The fourth probe asked participants about their age and how it has impacted their doctoral educational experiences. Participants’ responses yielded six categories. Specifically, the majority of participants reported that their age increased their focus/motivation to complete their doctoral degree in a timely manner. Other participants cited benefits associated with being an older student, experiencing no impact in relation to their age, as well a variety of miscellaneous responses. A number of participants also shared that they reframed negative experiences related to age, and disclosed witnessing or being a target of ageist remarks (see Table 25).

Table 25

*What About Age?*

Categories	<i>n</i> (%)
Increased focus/motivation to complete degree in a timely manner	4 (33.33%)
Benefits of being an older student (e.g., having work experience prior to entering graduate school, diversity of life experiences, wisdom)	3 (25%)
No impact (e.g., majority of students are similar ages)	3 (25%)
Miscellaneous (e.g., young age is a source of energy, experiencing pressure to graduate or form a family due to age, young age viewed as a hindrance)	3 (25%)
Reframing negative experiences related to age	2 (16.66%)
Witnessing or being the target of ageist remarks	2 (16.66%)

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Increased focus/motivation to complete degree in a timely manner.** A third of participants indicated that their age has had a positive impact on their educational experiences. Specifically, participants reported that their age increased their focus and motivation to complete their doctoral studies in a timely manner. For example, one participant shared the following:

That's also a motivating factor. I would really like to walk out of here around the age of 26 or 27 with a Ph.D. and sort of be like, 'I'm done with my education.' I can't say the same if I waited 2 or 3 years, if I was in my 30s. I can't say I would have started, let alone completed. I probably would have not completed it if I was any older. So, I think age has also been a great motivating factor, that like this is my time now to do this and then I can do other things that I want when I'm older.

Another participant described how her age and maturity have helped her to remain focused in graduate school:

It's made me more focused because now I feel like I'm in a part of my life where I know what it is that I wanna do and I don't wanna waste anymore time. Not wasting time, but like I feel like now I can dedicate, like I got, you know...your early 20s you got all that, you know, wanting to go out and stuff out of the way, like I feel like it's already gone, I'm set, I'm done with that type of lifestyle. Like now I wanna focus, I need something concrete to, you know, to continue my life so that I can move on to the next stage. So I really feel like I came back to graduate school at the age that I was supposed to, so I can really, like truly go through it and focus. So I think to me my age was really a factor in like my success.

**Benefits of being an older student.** A quarter of participants also viewed their age as a positive factor. Specifically, participants reported that their older age allowed them to gain valuable work experience prior to starting their doctoral programs, as well as to accumulate a diversity of life experiences and/or wisdom. Here is one account:

It has been helpful for the most part. Just, well the fact that I... the fact that I was able to work for a couple of years and come from a different country definitely gives me another, a different perspective to...yeah...maybe, especially people in Engineering that might start their PhD program like straight out of undergrad... so people starting their PhD like at 23 years old or something. Yeah, I think it has been a little bit beneficial to have just like, a little bit more experience behind me, both... just like in an actual work environment and life wise.

**No impact.** Another quarter of participants indicated that the majority of peers in their academic programs were in a similar age group and thus as a result, they did

not experience any age related issues. In the quote below, one participant explained why his age did not impact his doctoral educational experiences:

I would say nothing at all, not really. Yeah, a lot of... well not that many... so when I came straight from undergrad I was 20...21, 22 years old and a lot of them are my age, were that age too when they came in. So, it wasn't really an issue at all. It didn't help or not help.

**Miscellaneous.** Twenty-five percent of participants also provided a variety of miscellaneous responses to this question. For example, some participants noted that their young age was a source of energy. Others reported experiencing social pressure due to their age, such as a pressure to graduate or to form a family. The rest of participants noted that they viewed their young age as a hindrance. One participant described the various types of pressures she experienced as a result of her age:

It kind of does affect me, like my age... it kind of adds pressure to things. And then you know socially, you know my family sometimes asks me things about like being in a relationship and getting serious about like social life and all that other stuff, and I'm like 'woah, woah, woah' I need to focus right now on just like getting through the little things, like qualifying exams or something, rather than worry about the rest of that stuff. But you know, outside of my immediate family, like my parents and my other friends, like they say like 'I don't see why you can't be in school and be getting married.'

**Reframing negative experiences related to age.** A subset of participants also reported that they found it helpful to reframe negative experiences related to their age. For example, one participant shared the following account:

At first, I always felt embarrassed. Like the first semester I was like, 'I'm 28, what am doing here? Everyone's like 21 or 22'... but after the first semester, my boyfriend is 24, after the first semester I was like whatever...like I am way more qualified than a lot of these people and I'm this age and I have accomplished more than they will ever accomplish probably, even though they're younger.

**Witnessing or being target of ageist remarks.** Two participants indicated that they either witnessed or were the target of ageist remarks. In the following quote, one participant shared his experience being the target of ageist comments:

A lot of the times people are like ‘oh, you may be older, but I know more books,’ there is always that kind of like, ‘oh you may be older but...’ They assume, some of them assume, and have even told me like ‘oh we thought you...why did it take you so long?’ like ‘why are you, why are you so old and now doing it?’

The fifth probe asked participants “If you practice a religion, what has been the impact of that?” Table 26 provides a summary of the three categories that emerged from participants’ responses.

Table 26

*If You Practice a Religion, What Has Been the Impact of That?*

Categories	<i>n</i> (%)
Religion/Spirituality as a source of emotional support, encouragement, and/or motivation	7 (77.77%)
Do not practice a religion	2 (22.22%)
Miscellaneous (e.g., issues related to intersection of religion and education)	1 (11.11%)

*Note.* N = 9; Total does not equal 12 (100%) because three participants did not provide answers to this response category. Further, some participants endorsed more than one response category.

**Religion/Spirituality as a source of emotional support, encouragement, and/or motivation.** The majority of participants who responded to this

question indicated that practicing a religion and/or engaging in spirituality served as a source of emotional support, encouragement, and/or motivation. For example, one participant spoke directly about how religion provided her personal encouragement “It’s been what has kept me going. And being able to have, at times when its the hardest, is being able to have a positive outlook on different things, you know, just encouragement... personal encouragement and believing in myself.” Another participant described how spirituality has helped her through her doctoral studies and beyond:

Without spirituality, I wouldn’t be able to survive (laughs). Without that constant like help... and what can I say... many times...everything from having my ankle sprained, all the way to my medications, all the way to not having my family around, or just to be sitting in my bed or be sitting waiting for the bus stop...or even biking and having that self-awareness, and taking a breath and meditating...or even having a situation like the stuff we have talked about...or when I am frustrated with the downsides of my research or when something is not working...having that constant ‘okay, let me finish, let me meditate, and let me put my music’ and to have that connection with life. I remember my first year when I was passing through my qualifying exams, spirituality was a big portion and it is still...no matter the year, but that really helped me to go through, because I was able then to keep a clear mind on what I am, the present, and to focus. So, otherwise, if I was living without that...without that relationship with myself or my inner spirituality...then... I would be way...I don’t know if I would be able to be here, but it would be difficult and I would be unhappy, very unhappy... so I think that I stay as happy, because I stay with that spirituality.

**Do not practice a religion.** Twenty-two percent of participants who responded to this question reported that they did not presently practice a religion.

**Miscellaneous.** One participant provided a unique response to this question by indicating that pursuing higher education and the ideologies of the religion he practiced were in conflict. Below is his account:

My religion and being here conflict. Like, going to church I would hear like ‘oh don’t go to school,’ because you know ‘they take the God out of you, you

know, you just think now because you're educated and you think you know more? You know, you're gonna ignore the word of God.' And I'm like okay, well let's talk about the bible here, what's going on; it's a book, like any other, but you know, things like that. So, things like that or I hear like 'oh, you are losing your faith, you just want evidence because that's what they want you to believe in school.' So it's been... it's been in conflict. I think prayer has been helpful, but the ideologies of religion and education have been in conflict.

The sixth probe asked participants, "In terms of sexual orientation, how has that impacted your doctoral educational experiences?" Four main categories emerged from participants' responses (see Table 27).

Table 27

*In Terms of Sexual Orientation, How Has That Impacted Your Doctoral Educational Experiences?*

Categories	<i>n</i> (%)
No impact (e.g., no issues due to heterosexual orientation)	9 (81.81%)
Miscellaneous (e.g., few individuals identify as LGBTQ in the department, sexual orientation has increased self-awareness, preference to not identify primarily by sexual orientation, sexual orientation has shaped personal perspective and research)	3 (27.27%)
Local area and/or department are inclusive of LGBTQ community	2 (18.18%)
Experiencing assumptions of sexual orientation due to fashion preferences	2 (18.18%)

*Note.* N = 11, Total does not equal 12 (100%) because one participant did not provide an answer to this response category. Further, some participants endorsed more than one response category.



**No impact.** The majority of participants reported that their sexual orientation did not have an impact on their doctoral educational experiences. However, it is important to note that 83.33% of participants identified their sexual orientation as heterosexual, as illustrated by the following quote “I don’t think it had a big impact as well. I am straight; so I haven’t had... the majority of the program is straight, so I haven’t had any issues or anything about that.”

**Miscellaneous.** A number of participants answered this question by providing a variety of responses. For example, participants stated that in their academic programs few individuals identified as LGBTQ. Other participants noted that their sexual orientation has increased their self-awareness, as well as shaped their personal perspective and research. Lastly, another response included how a student preferred to not be primarily identified by his sexual orientation. One participant shared how his sexual orientation has had a positive influence on his research:

I think it’s given me... a different perspective, or a more open mind to...I mean I study discrimination, so like it’s definitely informed my research and my theories, and my thesis, about what I think is happening in the brain and what is happening in the social context. I can borrow from being discriminated based on my race and being discriminated based on my sexual orientation; how does that look different, how does that look the same, what overlaps. So, it gives me a very good point of critical reference to everything that I do within my research, my line of research.

**Local area and/or department are inclusive of LGBTQ community.** A subset of participants reported that their departments and/or local area were welcoming towards the LGBTQ community. For example, one of the participants stated, “I feel like they are more so open to, you know, people being of various sexual orientations, etcetera. I think they are more so open and just, you know, welcoming and accepting of those kinds of things.”

### **Experiencing assumptions of sexual orientation due to fashion**

**preferences.** Two participants disclosed that they have had experiences in which others made assumptions regarding their sexual orientation due to the way they dressed. Here is one account “People probably think that I’m not heterosexual based on how I dress sometimes.”

The seventh probe asked participants “What about other social identities, such as ability/disability, language fluency, immigration status, or any other social identities I did not mention here? How have they impacted your doctoral educational experiences?” Eight categories emerged from participants’ responses, as illustrated in Table 28. The majority of participants responded to this question by providing a variety of answers. For example, participants reported experiencing challenges related to being an English as a second language speaker, methods used to cope with language discrimination, and difficulties associated with relocating for graduate school. Similarly, other participants spoke about the positive impact of their multilingual abilities, challenges experienced due to cultural differences or disability/mental illness, as well as the impact of being raised in a specific region or setting.

Table 28

*What About Other Social Identities, Such as Ability/Disability, Language Fluency, Immigration Status, or any Other Social Identities I Did Not Mention Here? How Have They Impacted Your Doctoral Educational Experiences?*

Categories	<i>n</i> (%)
Miscellaneous (e.g., difficulty expressing concerns to faculty who lack understanding of certain issues, impact of immigration status, experiencing and coping with challenges associated with low socioeconomic status, desire to assist students with cognitive disabilities, impact of being the first in the family to pursue a doctorate degree)	5 (41.66%)
Challenges experienced as an English as a second language speaker (e.g., accent, pronunciation of science terms)	2 (16.66%)
Methods used to cope with language discrimination	2 (16.66%)
Difficulties associated with relocating for graduate school	2 (16.66%)
Positive impact of language abilities (e.g., engaging with research population, expanding professional network, increased opportunities)	2 (16.66%)
Challenges due to cultural differences (e.g., differences in cultural customs, being cautious when expressing views)	2 (16.66%)

Challenges experienced due to disability/mental illness	2 (16.66%)
Impact of being raised in a specific region or setting (e.g., impact of being a northerner or coming from an urban area)	2 (16.66%)

---

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Miscellaneous.** The majority of participants gave a variety of responses to this question. For example, some participants shared that they experienced difficulties in expressing concerns to faculty who lack an understanding of cultural issues. Others reported experiencing challenges due to their immigration status, as well as coping with the challenges associated with a low socioeconomic status. Additionally, certain participants indicated having a desire to assist students with cognitive disabilities and talked about how being the first in their family to pursue a doctorate degree has impacted them. Below is a participant’s account about how her socioeconomic status has impacted her:

Universities are all about diversity and inclusion, but how are they supposed to include me when they don’t even offer me... offer to like pay. I mean they can pay people to go to their freaking Open House, people who are being like accepted into Harvard and Yale and would never look at [*sic*]; but then students who have accepted to going to [*sic*] are not treated the same way, and I had to do everything like I didn’t know... I had no idea how I was gonna get there. I could have gotten a part time job in Puerto Rico, fine, but it was not gonna be enough anyway. I had to find somewhere that would pay me more than \$15 an hour and I was lucky, and like how I said, because I maintained that network of mentors outside of like my main advisors, I’ve been able to do those things. It’s been a challenge and my biggest challenge has always been money.

Another participant spoke about how being the first in her family to pursue a

doctorate has inspired other members of her family to further their education, as well as given her motivation to continue:

It's also probably a motivating factor to my parents. My dad likes to act like he doesn't want me to become a doctor, to put too much pressure on me, but it's definitely hidden under there. And I think more recently, I think some of my cousins decided to take that path. So, that has helped me along the way and helped me motivate myself to continue, just because knowing that I can at least give them the idea that it's possible has been great.

**Challenges experienced as an English as a second language speaker.** Some participants also disclosed that they have experienced challenges due to English being their second language. Here is a participant's account:

The way I say some terms, some chemical terms, because I learned them in Spanish...people get really annoyed when you don't say words or pronounce them correctly....it's not even correctly, they get annoyed if you don't pronounce it the way they want you to pronounce it. So that brought me a lot of problems and I was ridiculed because of that.

**Methods used to cope with language discrimination.** A subset of participants responded to this question by sharing the methods that they used to cope with language discrimination. For example, one participant shared the following "Even though ignorant people would focus on everything that I say. Now, when someone says something I say, 'yeah, I have an accent because I speak a lot of languages. So how many do YOU speak?' (laughs)."

**Difficulties associated with relocating for graduate school.** Another subset of participants reported that they experienced difficulties with the process of relocating for graduate school. In the quote below, one participant described the various challenges he experienced:

I got to say, it was terrible those first few months, cause I moved in from Puerto Rico straight to this...and I never lived in the States. I have only been in the United States once or twice beforehand. And so there was not really a lot of

help getting the things I needed for an apartment, like at all. Like I slept on the floor for the first few nights and I just did not know where anything was, or I didn't really understand how the United States worked, and a lot of things. Because even though Puerto Rico is like part of the States, there are a lot of things that are different, so I felt really lost. I had no idea who I could ask for help or if it was not...I was also aware like trying to make sure I didn't make a fool of myself, like trying to ask these questions that might seem obvious for other people that live in the States. But yeah, it was...it was a terrible experience.

**Positive impact of language abilities.** Sixteen percent of participants noted that their language abilities have had a positive impact on their doctoral educational experiences. For example, participants indicated that their language abilities has allowed them to better engage with research populations, has expanded their professional networks, and/or has increased the number of opportunities available to them. Here is one account:

Being fully bilingual does help, does help, because a lot of the projects here require or there's a limited amount of graduate students who can speak two languages. And when we work with the Latino communities here in [*sic*], we need Spanish-speaking people. So they have called me into some of the projects to support in the translation of forms, of IRB forms, consent forms, to help in the phone calls, to help in the data collection, to go into the community and make a connection, to talk to the families, and why? Because of the way that I look, the fact that I can speak another language has been helpful. So yeah, definitely the bilingual is a very strong factor here like for me, that gives me opportunities and opens doors.

**Challenges due to cultural differences.** Some participants also reported that they experienced challenges due to cultural differences. Specifically, participants indicated that the challenges surfaced as a result of distinct cultural customs or feeling the need to be cautious when expressing views to others, due to fear of a statement being 'lost in translation.' For example, one participant shared the following experience:

Because of the difference in culture, I'm always cautious of what I say and how I say it, because I don't want it to get lost in translation. When I make a joke that is funny in Spanish and then you try to say it in English and you have to think about a lot of the issues that can come out of that (laughs).

**Challenges experienced due to disability/mental illness.** Other participants shared that they encountered challenges in their doctoral educational experiences due to their disability or preexisting mental illness. One of the participants spoke directly about how her anxiety has impacted her doctoral studies:

The anxiety.... definitely, because I didn't seek help the first two years. It wasn't until the... my second year when I was like, I was in a class I had to pass or maybe I would have been kicked out of the program. I think the anxiety was really complicated because I had taken it as 'this is just how it is', but then, that's when it became much more abnormal and I didn't think I had a huge channel for it until way later in the game.

**Impact of being raised in a specific region or setting.** Two participants indicated that being raised in a specific region or setting impacted how they viewed their educational experiences. Specifically, participants reported that "being a northerner" or "coming from an urban area" influenced them. Here is one account:

I feel like there's a difference between people that were raised in like a rural setting versus an urban setting. I feel like the way that like people think or approach problems has got to do with a lot of the way that you were raised, right? So, I feel being from the city, being cautious about my surroundings, trying to...seeking out help whenever I needed it. I feel like that's the way that I approached problems when I was living in the city. I do that now here, I try. I am aware of my surroundings, I see like you know--where's like the closest gas station, where's the closest...you know even tailor, things like that, that people don't think about. Like, I feel having that...that the way that you think, like your surroundings. Like there was another time too that I was thinking, like I'm a teaching assistant and I was thinking like god forbid anything were to happen...like where's the exit? Where...you know, if I had to protect my students because of all you know the shootings that have happened, how am I gonna do it? Like you think about these things; whereas, I don't know, maybe if you've never encountered robbery or theft, or like any type of event like that, you just don't think about it. So, I think...I think definitely where you grew up or how you grew up has influenced me too on how I execute, you know, my

job as a teaching assistant or as a researcher, you know? So, I think that definitely contributes.

*Research Question 3: What recommendations would doctoral students of color in STEM provide to other underrepresented racial/ethnic minority students who are starting their doctoral programs in a STEM field?*

The last interview question asked participants what advice they would give to other students of color who are beginning doctoral programs in a STEM discipline.

Table 29 provides of summary of the seven categories that emerged from participants' responses.

Table 29

*If You Were Talking to a Group of Racial/Ethnic Minority Students Who Just Got Accepted Into Your Doctoral Program, What Do You Think They Should Know Before They Get Started? What Recommendations Would You Provide to Them to Increase Their Success in the Program?*

Categories	n (%)
Importance of finding a support system (e.g., outreach to various minority student groups; seek communities for social identities you identify with; be involved in the university community; maintain close relationships with family, advisor, and lab group)	8 (66.66%)
Do not be afraid to ask questions, obtain academic assistance, or seek mental health support	5 (41.66%)
Importance of being proactive, determined, and having self-	5 (41.66%)



initiative (e.g., seek opportunities for professional development, obtain peer mentoring, start dissertation early)	
Prepare to be challenged and view challenges as opportunities for growth	4 (33.33%)
Take time for yourself (i.e., self-care)	2 (16.66%)
Be prepared that others will make assumptions or underestimate you based on your race/ethnicity, nationality, and/or manner of speaking	2 (16.66%)
Miscellaneous (e.g., prioritize research over classes, organization and time management, do lab rotations and observe how principle investigator interacts with others, do not let the absence of diversity deter you from pursuing graduate school, be aware of your comfort with limited diversity prior to entering a program, be well-prepared academically to counteract low expectations)	2 (16.66%)

---

*Note.* Total is not equal to 12 (100%) given that some participants endorsed more than one response category.

**Importance of finding a support system.** The majority of participants highlighted the importance of finding a support system within or outside their academic programs. Specifically, participants suggested outreaching to various minority student groups; seeking communities for social identities one identifies with; getting involved in the university community; and maintaining close relationships with

family, advisor(s), and their lab group. For example, one participant provided the following advice:

Find support groups within other graduate student groups. I felt like that definitely maintained my sanity during all the other obstacles I was going through. So a lot of mentoring and getting involved with your community or organizations on campus. Feel included, don't isolate yourself.

Another participant offered a similar suggestion:

Outreach to different students and social groups for minorities. And even, even if it's just, I guess like have a sense of community or people who like are similar to you...and I don't know, well I guess especially like for people coming outside the U.S., it's just... trying to be open minded and put yourself out there.

**Do not be afraid to ask questions, obtain academic assistance, or seek mental health support.** A number of participants also shared that they would advise incoming students to not be afraid to ask questions, obtain academic assistance, and/or seek help from a mental health professional, if needed. In the quote below, one participant explained how tutoring has benefited her doctoral studies:

If you feel even the least bit... like even if you are two weeks into your classes and you feel like you are struggling, get help. Like, don't be afraid to get tutoring and find some sort of tutoring. Like after my first semester, I literally did tutoring for almost every class, even if it wasn't too bad. I was just like, I don't care, I'm not taking any more chances. And so I would say like, get tutoring, even if you are in the second week and you are just like 'what is happening, okay I'm not sure, but I think I can figure it out.' No, don't, don't give yourself that big of a benefit of the doubt, just go for it. Like do tutoring, it's not going to... trust me; even if you do know it, okay it would just serve as a review, like it can just serve as you studying and reviewing.

Another participant spoke directly about the importance of seeking professional mental health support "Also paying attention if you also suffer from anxiety or depression and seeking help for that too, counselors maybe that your university provides."

### **Importance of being proactive, determined, and having self-initiative.**

Forty-one percent of participants indicated that they found it important to be proactive, determined, and have self-initiative in order to succeed in graduate school. For example, participants recommended that incoming doctoral students should seek opportunities for professional development, obtain peer mentoring, and start their dissertations early. One participant had the following recommendation:

Don't wait for your principal investigator or for someone in your lab to tell you that you should do a, b, and c. It's your...you should take charge of your project and try to move forward as soon as you can.

Another participant suggested, "Definitely being constantly looking for other opportunities, even for awards given our specific background."

### **Prepare to be challenged and view challenges as opportunities for growth.**

A third of participants recommended for students to prepare themselves to be challenged in their doctoral programs; however, at the same to view those challenges as opportunities for growth. For example, in the quote below, one participant shared the difficulties he encountered in transitioning to a predominately White institution, as well as how that experience has made him stronger:

Be very ready to be challenged, because of where we are. You know, being in California, in a diverse place, I was very comfortable with my identity; it was never something that I ever questioned, I was fluid and in and out of spaces and never questioned it...and coming here I said, 'be ready to be challenged, be ready to, you know, feel uncomfortable.' But then, you become stronger in who you are, and be secure, and just walk with your head held high and walk through the spaces, because you got in and you belong here.

**Take time for yourself.** Participants also underscored the importance of taking time for themselves and recommended for students to engage in self-care activities.

One participant noted the following:

I also feel like it's important to take time for yourself. This is temporary, but this doesn't define you, it shouldn't change you, so you should prioritize you and your health...and take things one at a time, you know. Take 30 minutes and do nothing, or just read a book and have a cup of coffee, or you know go to church, or meet with friends you know. Like do something fun, focus on yourself even if it is a couple of hours in one day of the week. Like I said, I usually meet with a friend like every other Friday and then over the weekend I work pretty much all Saturdays of the week, but on Saturdays and Sundays I try, you know, to not work more than 4 or 5 hours if I could. I can, you know, do some lab work at work, but I try to also take some time for myself because I learned the hard way that you will feel burnt-out and then Monday comes and you realize that you didn't do anything for you and then you will be tired the whole week.

**Be prepared that others will make assumptions or underestimate you based on your race/ethnicity, nationality, and/or manner of speaking. A**

subset of participants also suggested that it is important for incoming students to be prepared that others may make assumptions and/or underestimate them based on their race/ethnicity, nationality, and/or manner of speaking. One participant shared her personal experience being subjected to assumptions from others and had this recommendation:

They just accepted another Puerto Rican. They sent me an email, they were like 'you are not gonna be the only Puerto Rican in the department', which I found very offensive, but whatever. So, I'm gonna meet this guy at the Open House and I'm going to tell him like 'you are gonna get asked if you have a visa and you are Puerto Rican.' I don't know if he has an accent, like they will probably not like his accent.

**Miscellaneous.** Two participants also provided a variety of miscellaneous responses. For example, participants highlighted the importance of prioritizing research over classes, as well as being organized and having effective time management. Participants also recommended doing lab rotations and observing how the principle investigator interacts with others. Another suggestion was to not let the absence of diversity in a university be a deterrent from pursuing a graduate degree, as

well as other responses. One participant had the following advice in relation to being in a predominately White institution:

Don't feel like if you don't see someone who looks like you, don't feel like you cannot go there, you know? You can make the decision of whether that's the place for you or not, but you know, don't let that be the only reason for you to base your decision on, because at the end of the day, graduate school is something temporary.

## CHAPTER 5

### DISCUSSION

The current study used semi-structured interviews to examine the supportive and challenging factors underrepresented minority students encounter in an academic setting as they obtain doctoral degrees in STEM fields of study. Further, this study explored the impact of students' multiple social identities on their educational experiences, as well as the recommendations these students would provide to other underrepresented racial/ethnic minority students who are starting doctoral programs in STEM. The interviews yielded rich descriptions regarding the doctoral educational experiences of underrepresented minority students. Specifically, it provided insight into the supportive factors and unique challenges experienced by this population; as well as how intersectionality has impacted their academic experiences. In addition, participants provided valuable suggestions incoming doctoral students of color can utilize to help increase their success as they pursue doctoral degrees in STEM.

#### **Supportive Factors in Doctoral Programs**

Participants described in detail the supportive factors that have facilitated their success in their doctoral programs. The majority of participants regarded the support received from faculty, mentors, advisors, and program directors as a major positive factor in their success. Many also found that involvement in academic enrichment programs or associations at their university helped them feel supported. Several participants also reported that the support obtained from family, partners, friends, fellow students, as well as other students of color, contributed to their academic success. Interestingly, participants also reported similar responses when they were

probed in a subsequent question concerning the role faculty and peer mentoring played in their doctoral educational experiences. Participants cited that the mentorship and support they were able to receive from previous or current faculty, peers, academic enrichment program directors, and other students of color has been pivotal to their success in their doctoral programs.

These findings are consistent with previous research studies that highlight the supportive role of faculty, family, peers, and professional associations/academic enrichment programs in the educational experiences of students of color (Alexander, 2001; Davis & Lincht, 2011; Grady, 1998; Koenig, 2009; Tinto, 1993). For example, Grady (1998) found that the mentorship a student of color receives from faculty and peers is one of the most influential variables in fostering a student's academic engagement and persistence in STEM. In addition to mentoring, studies have also found that students of color who participated in professional organizations at their universities were able to network and build connections with fellow students, thus reducing the isolation they might feel at a predominately White institution (Giordano, Davis & Licht, 2011). A very important finding, however, is that over half of the participants in this study reported that they had limited or no support from current faculty. Similarly, a quarter of participants indicated that peer mentoring in their department was minimal or not present. Considering that these two factors are critical to students' academic success in STEM, this is an area doctoral programs should recognize and integrate.

Participants in this study also spoke about the personal characteristics that have helped them succeed in their doctoral programs. Persistence, determination, self-drive,

as well as an ability to adapt and reframe negative situations were cited as key characteristics. Participants also highlighted the importance of being open to learning from others and asking questions. Interestingly, resilience, a characteristic that embodies the ability to persist, adapt, and reframe negative situations has been identified in previous studies as a positive factor that supports underrepresented minority students' perseverance in STEM academic programs (Colbeck, Cabrera, & Terenzini, 2001; Meir, 2002; Thompson, 1998).

Participants were also asked to describe the peer support they received in their programs, as well as the other types of social support they obtained at their universities, but outside of their graduate program. In terms of peer support within their programs, the majority of participants indicated that their programs had a supportive and collaborative atmosphere. Many participants also reported that they obtained support from peers within their labs/research groups, as well as from other students of color. Outside of their programs, participants found social support through their involvement in organizations, associations, student groups, fellowships, academic enrichment programs, or other university centers (e.g., cultural centers). Previous studies have indicated that peer support positively influences the academic retention of students of color (Tinto, 1993; Zea, Reisen Beil, & Caplan, 2003). For example, Tinto (1993) found that a student's ability to persist in college was highly dependent on their ability to develop social support systems in their institutions.

This study also sought to gain insight about the financial support students received in their programs, as well as the degree of culturally relevant curriculum included in their programs. In terms of financial support, the majority of students



reported that financial support was not an issue, citing that their doctoral programs guaranteed funding or that they were able to obtain other sources of financial assistance, such as fellowships, scholarships, or grants. This is an important and encouraging finding considering that the National Academy of Sciences (2011) regards financial support as one of the most important variables for increasing recruitment and decreasing attrition of talented URM students in STEM.

In terms of academic curriculum, however, all participants reported that their doctoral curriculum was not culturally relevant. Participants described that their exposure to culturally relevant materials was limited to departmental workshops or other short-term activities. Further, many indicated that their programs lacked an awareness of multicultural issues, had limited diversity, and that if becoming culturally competent was an objective, this goal would have to be pursued on the student's own personal time. The inclusion of culturally relevant curriculum is an important element doctoral programs in STEM should prioritize and integrate. Culturally relevant pedagogy is essential, as it has been found to be a supportive factor for augmenting the educational attainment of students of color (Denson, Avery, & Schell, 2010). Similarly, it has served as a motivator for students to pursue and persist in STEM careers by helping them view science as a channel for social change (Villegas & Lucas, 2002).

In addition to these questions, participants who were previously or currently involved in academic enrichment programs were specifically asked if their participation in those programs had facilitated their doctoral educational experiences. Further, participants also elaborated on the support systems, outside their universities,

that they relied on to help them during this process. In terms of academic enrichment programs, participants reported that these programs had a positive impact on their doctoral educational experiences by providing them networking opportunities, an environment to form lasting relationships, preparing them for graduate school, as well as giving them needed mentorship and support. This is consistent with previous findings on the positive impact of academic enrichment programs. For example, research done at the undergraduate level has shown that involvement in these types of programs has resulted in higher graduation rates and increased post-graduate enrollment (Koenig, 2009). In terms of support systems outside of school, the majority of participants indicated that they relied on their family and significant others. They also reported that religion/spirituality, friends, and participation in professional associations were a source of support. These findings are congruent with previous research on the impact of community level factors on the educational advancement of students of color. For instance, a study by Alexander (2011) found that graduate students of color at predominately White institutions utilized family support systems and religion/spirituality in order to cope with the challenges they experienced in academic settings.

### **Challenging Factors in Doctoral Programs**

In addition to supportive factors, participants also described the various challenges they encountered in their respective doctoral programs. The majority of participants reported that having an advisor who was negligent or unsupportive, as well as adjusting to being a student at a predominately White institution were two of the major challenges experienced. Similarly, when participants were specifically asked

to describe their experiences as a person of color on campus, several reported feeling unable to fit in with their peers, lacking a sense of belonging, and feeling isolated. In fact, in a subsequent question, 63% of participants disclosed that they had experienced isolation in their department, program, and/or institution. In addition, several participants also characterized their campus environments as hostile, lacking diversity, and noted that they had experiences in which they were the target of intentional or unintentional racial slights. Interestingly, 72% of participants reaffirmed this latter point in a subsequent question by stating that they had indeed experienced racial microaggressions in their doctoral programs. These findings underscore the importance of providing mentoring and recognizing the unique difficulties students of color experience at predominately White institutions. As noted by Kreuter and colleagues (2011), mentoring has been identified as a key variable in the educational attainment of URMs. Further, various studies have shown that graduate students of color at predominately White institutions are presented with distinct challenges, such as encountering adverse campus climates, racial microaggressions, and cultural isolation (Brown & Dancy, 2010; Gay, 2007; Robinson, 2012; Torres et al., 2010). Given the implications of these results, STEM doctoral programs would benefit from considering the impact of these factors, targeting specific supports for these students, as well as having knowledgeable leaders who could implement these changes.

Participants in this study were also asked about the racial/gender make-up of their classes and how this has impacted them. In terms of racial composition, the majority of participants indicated that students in their classes were predominately White or Asian. Conversely, in terms of gender, the majority of participants viewed

their programs as gender balanced and reported that in recent years the number of females in their programs has dramatically increased. Nevertheless various participants indicated experiencing difficulties in the classroom related to their race and/or gender. For example, participants reported that they felt pressure to represent their race/gender or to have to constantly prove their competence to others. Similarly, a number of participants also disclosed that they encountered situations in which they were excluded from study groups or were treated in an inferior manner due to their race/gender. Interestingly, a quarter of participants shared that they reacted to these experiences by initiating activities in their respective programs, departments, or institutions aimed at increasing diversity and elevating cultural awareness.

These results are consistent with previous findings on the experiences of students of color in higher education. For example, studies have found that graduate students of color in Physical and Health Sciences, Psychology, Humanities, and Education programs experience RMs in the areas of invisibility/hypervisibility, ascriptions of intelligence, and treatment as a second class-citizen (Gay, 2007; Robinson, 2012; Shah, 2008; Torres et al., 2010). For instance, participants in those studies who experienced hypervisibility reported that they were often expected to serve as the “cultural voice” in their classes, given that they were the only one or one of the very few racial/ethnic minorities present. Similarly, studies at the doctoral level have found that Latino and African American students’ intellectual capabilities tend to be frequently questioned in comparison to their White peers (Robinson, 2012; Torres et al., 2010). These research findings may explain why participants in this study often

felt pressured to represent their race/gender or to constantly have to prove their competence to others.

Participants were also asked if they encountered difficult dialogues on diversity issues (e.g., race/ethnicity, sexual orientation, disability, religion, social class, age, immigration, or gender) in the classroom or lab setting. The majority of participants indicated that difficult dialogues do occur; however, not within the classroom setting. Participants noted that often times these discussions took place within their lab group, with their peers, or during training workshops on diversity issues. It is important to note that during this question, many participants also disclosed, once again, that they have had experiences in which they witnessed or were the target of offensive remarks. These findings are consistent with the responses participants provided when they were asked about the presence of culturally relevant curriculum in their programs. Participants previously reported that their programs did not integrate culturally relevant curriculum, therefore, the absence of dialogues on diversity issues is not surprising. As noted earlier, culturally relevant pedagogy has been found to be a supportive factor for students of color (Denson, Avery, & Schell, 2010). However, discussions on diversity are beneficial to all and critically needed in order to elevate students' cultural awareness and increase cross-cultural understanding.

### **Impact of Multiple Social Identities on Doctoral Educational Experiences**

Participants were asked to describe how their multiple social identities have impacted their doctoral educational experiences. Participants reported both benefits and challenges associated with their various social identities. Specifically, half of

participants reported that their multiple social identities have served as a source of motivation, empowerment, or have aided their academic achievement. Conversely, participants also reported that their intersectionality has made it difficult to relate to others, caused them to feel isolated, and/or created challenges in navigating friendships.

Participants were also prompted about the impact their gender and race/ethnicity has had on their doctoral educational experiences. In terms of gender, female participants spoke about the sexism they experienced in their programs and how they have learned to cope with it. For example, several participants highlighted the importance of being assertive and indicated that they have learned sexism coping strategies from other women in STEM. In terms of race/ethnicity, the majority of participants indicated that it had a positive impact on their doctoral education. For instance, many participants noted that their racial and ethnic background served as a source of motivation, positively shaped their self-concept, and provided them the ability to share their culture with others. However, a number of participants also stated that their race and ethnicity made it difficult to connect with others and has resulted in having to constantly combat stereotypes and assumptions.

The challenges associated with a student's gender and race/ethnicity are consistent with previous research on intersectionality. For example, in a study by MacLachlan (2006), women in STEM reported that they had to be more aggressive than their male peers if they wanted their work to be recognized. Further, MacLachlan (2006) also found that women of color, in particular, felt that their advisors frequently underestimated their intellectual capabilities and did not treat them as future scientists,

but rather as representatives of their race. Nevertheless, the findings of the present study are encouraging. Many participants shared examples of resilience, such as their willingness to learn from other women in STEM about how to effectively cope with sexism, as well as recognizing the positive aspects of being a racial/ethnic minority in the sciences.

In addition to gender and race/ethnicity, participants were also asked about the impact their social class, age, religion, and sexual orientation has had on their doctoral educational experiences. In terms of social class, the majority of participants reported that their socioeconomic status has had a positive impact. Specifically, participants noted that since starting their doctoral programs, they experienced an improvement in their financial status. In terms of age, participants provided a variety of responses. For instance, some participants reported that their age increased their focus and motivation to complete their doctoral studies in a timely manner. Other participants reported benefits associated with being an older student, whereas others noted that their age has had no impact on their doctoral educational experiences.

Participants who practiced a religion/spirituality also spoke about the impact of these factors on their doctoral education. Overall, the majority of participants viewed religion/spirituality as a source of emotional support, encouragement, and/or motivation. Moreover, in terms of sexual orientation, the majority of participants in the study reported that their sexual orientation has had no impact on their doctoral educational experiences. However, it is important to note that 83.33% of participants in this study identified as heterosexual. Overall, although research on the impact of sexual orientation has been largely absent from the literature, research on the impact

of religion/spirituality has shown that these aspects support students of color as they obtain advanced degrees by providing them a method for coping with the challenges encountered in an academic setting (Alexander, 2011).

Lastly, in reference to the impact of multiple social identities, participants were also asked if any other social identity, not previously mentioned, had an impact on their doctoral educational experiences (e.g., ability/disability, language fluency, immigration status). A subset of participants responded to this question by reporting that they experienced challenges associated with being an English as a second language speaker. For example, they noted difficulties in pronouncing scientific terms or challenges associated with having an accent. This is an important finding to take into account, especially when considering that the impact of language fluency on the experiences of students of color in doctoral programs has been largely absent from previous research. In sum, when taking all these aspects into account, doctoral programs invested in not only recruiting, but also in supporting doctoral students of color in STEM, should be aware of the multiple challenges this subset of students encounter as they obtain advanced degrees.

### **Recommendations for Incoming Doctoral Students of Color in STEM**

All participants also provided recommendations for underrepresented minority students who are beginning doctoral programs in STEM. The majority of participants highlighted that it was important for incoming students to find a support system within or outside their academic program. For example, participants suggested outreaching to various minority groups, seeking communities for social identities one identifies with, becoming involved in the university community, and maintaining close relationships



with family, advisors, and their lab group. Participants also recommended for incoming students to not be afraid to ask questions, obtain academic assistance, and/or seek help from a mental health professional, if needed. A number of participants also spoke about the importance of being proactive and determined. For example, students in this study recommended seeking opportunities for professional development, obtaining peer mentoring, and starting the dissertation process early. Additionally, participants recommended for incoming students to prepare themselves to be challenged in their doctoral programs, while at the same time learning to view those challenges as opportunities for growth. Lastly, participants also emphasized the importance of engaging in self-care practices. These recommendations highlight not only the actions incoming doctoral students of color in STEM can engage in, but it also provides valuable information for program directors interested in supporting the success of underrepresented minority students in STEM.

### **Limitations and Methodological Considerations**

There were a number of limitations in this study that are important to consider when interpreting the findings. First, the sample size may be considered a limitation. A larger sample size would have provided a higher diversity of participants and may have uncovered additional information about the supportive and challenging factors encountered by this population of students. However, it is important to also highlight that qualitative research typically has a small number of participants (Patton, 2002).

It is also important to consider that this study sought to understand the impact of multiple social identities on the educational experiences of underrepresented doctoral students in STEM. Diversity in terms of ability, sexual orientation, and

citizenship status were lacking in this study, which therefore impacted the richness of responses this study yielded in those domains. A larger sample size, or a targeted approach for recruiting students with diversity in those areas, would have been beneficial.

Similarly, another limitation worth noting is that Alaska Native and American Indian students were not represented in this study. Although efforts were made to recruit underrepresented minorities in STEM from various racial/ethnic backgrounds, no participants from those backgrounds completed this study. Similarly, it is important to note that this study had a higher representation of Latina/o students in comparison African Americans. Therefore, the generalizability of this study may be limited by this factor.

Further, it is also important to acknowledge the impact of reflexivity. Reflexivity refers to how a researcher may influence the interpretation, or meaning, of study findings through the research process (Willig, 2001). Reflexivity is a controversial concept that has been argued to be a hindrance, as well as a benefit, depending on the epistemological views of the researcher. For positivists, who believe the aim of research is to produce knowledge without the personal involvement of the researcher, reflexivity is viewed as a hindrance. However, for researchers who do not subscribe to this philosophical view of science, reflexivity is seen as a beneficial aspect of the research process that places a value on the contributions of the researcher, in terms of the insight into formal and informal practices that they are able to provide (Camic, Rhodes, & Yardley, 2003). I believe my background and life experiences provided me an advantage in this study. I was able to connect and easily

build rapport with the participants, which facilitated and enriched the interview process. However, it is important to recognize that while this may have facilitated the research process, it also may have led to confirmation bias and influenced the way participants responded.

### **Directions for Future Research**

Future research could focus on a variety of areas and build upon the findings of the present study. For example, it would be beneficial to further examine the experiences of students with specific social identities. Unfortunately, one of the limitations of this study was that sexual minorities, individuals with disabilities, as well as undocumented students were minimally represented. Therefore, a follow up study that targets these groups would provide a deeper understanding of the unique supportive and challenging factors encountered by this subset of students.

Future research should also consider examining the educational experiences of doctoral students of color in STEM at minority serving institutions. The present study only included students attending predominately White institutions. It would be valuable to understand how attending historically Black colleges and universities, Hispanic serving institutions, or tribal colleges impacts the types of supportive and challenging factors experienced by these students.

It would also be beneficial to replicate this study by using quantitative methods, as it may provide additional empirical support for the findings of this study. For example, a scale that assesses doctoral students' perceptions of their departmental racial climate could be utilized in conjunction with other measures related to academic success in order to ascertain the level of impact it has on a variety of key areas (e.g.,

academic performance, mental health, research productivity, degree attainment). Similarly, future research should focus on better targeting American Indian and Alaska Native doctoral students. This study did not include students from these racial/ethnic backgrounds; therefore, in order to fully understand the supportive and challenging factors experienced by underrepresented minority students in STEM doctoral programs, representation of these students is essential.

### **Contributions of Present Study**

This study provides unique contributions to the research knowledge base, as well as practical applications/recommendations for academic programs and incoming doctoral students of color in STEM. First, this study expands the knowledge base of STEM issues in higher education by highlighting the key challenges and supportive factors students experience in doctoral programs at predominately White institutions in the U.S.. Research on STEM issues in higher education has typically focused on the experiences of undergraduate students, or the challenges experienced by a specific racial/ethnic group. This study differed from previous studies in that it only focused on the educational experiences of students at the doctoral level and targeted severely underrepresented students in STEM (i.e., Latina/os, African Americans, and American Indian/Alaska Native students). Furthermore, this study is unique in that it also explored the impact of intersectionality on students' doctoral educational experiences. Intersectionality is a critical factor to consider in understanding students' perspectives and lived experiences; yet, it is a topic that is under researched, especially as it pertains to education at the doctoral level.

In addition to contributing to the research knowledge base, this study also provides practical information and recommendations that programs can utilize to retain and better support doctoral students of color. For example, this study highlights the positive impact of receiving support from faculty, mentors, family, friends, and other students of color. Further, it underscores the benefits associated with exposure to culturally relevant pedagogy, as well as the influence of being involved in academic enrichment programs or associations. Lastly, this study also provides specific recommendations for incoming doctoral students of color in STEM. This information can be utilized to better prepare incoming students from underrepresented backgrounds and to increase their doctoral academic success.

### **Contributions to the Field of School Psychology**

In order to understand the contributions of this study to the field of school psychology, it is important to begin by highlighting the present diversity within public schools in the U.S., as well as the current trends within school psychology. In terms of school composition, schools in the U.S. are becoming increasingly diverse. Specifically, according to the National Center for Education Statistics (2017), as of Fall 2017, public schools in the U.S. were comprised of 50.7 million students. From this total, 26.3 million (i.e., 52% of public school students) belonged to one or more racial/ethnic minority groups. Unfortunately, the growing student diversity within public schools in the U.S. and the demographic trends of the school psychology workforce are largely divergent. Currently, school psychologists from culturally and linguistically diverse backgrounds are underrepresented within the school psychology workforce (Curtis, Grier, & Hunley, 2004; National Association of School

Psychologists, 2017). Specifically, approximately 87% of school psychologists are White and less than 8% provide services in a language other than English (National Association of School Psychologists, 2017).

As the data demonstrates, a shortage of culturally and linguistically diverse school psychologists exists. The National Association of School Psychologists has specifically stated that in order to address this shortage, programs need to improve their retention efforts, especially as it pertains to students of color (National Association of School Psychologists, 2017). This study contributes to these efforts by exploring how to best support doctoral students of color in STEM. Augmenting our knowledge in this area is a step towards improving the retention of students of color at the doctoral level and increasing the cultural and linguistic diversity of the school psychology workforce.

## Appendix A – Demographic Questionnaire

*Dear participant: As noted in the consent form, the information you share in this questionnaire is confidential. Participation in this study is voluntary and you may refuse to answer any questions. Thank you!*

1. How do you identify racially and ethnically? \_\_\_\_\_
2. What is your gender? \_\_\_\_\_
3. What is your age? \_\_\_\_\_
4. What is your sexual orientation? \_\_\_\_\_
5. Do you have a disability? If so, please specify: \_\_\_\_\_
6. What is your marital status? \_\_\_\_\_
7. Do you practice a religion? If so, please specify: \_\_\_\_\_
8. What is your socioeconomic status (e.g., Low-income: less than \$32,000; Middle-income: \$32,000-100,000, or Upper-income: \$100,000 or more annually)? \_\_\_\_\_
9. What languages do you speak? \_\_\_\_\_
10. What is your country of origin? \_\_\_\_\_
11. If born outside the United States, for how long have you lived in the United States? \_\_\_\_\_
12. Are you an undocumented student? \_\_\_\_\_
13. What state do you currently live in? \_\_\_\_\_
14. What is the highest degree that you have completed? \_\_\_\_\_
15. Are you the first in your family to attend a doctoral program? \_\_\_\_\_
16. What doctoral degree in STEM are you currently pursuing? (e.g., Ph.D. in molecular biology, psychology, mathematics, etc.) Please be specific: \_\_\_\_\_
17. What is your current year in the doctoral program? \_\_\_\_\_

18. Have you participated in a minority research preparation program in your undergraduate/graduate institution (e.g., Ronald E. McNair Scholars Program, Minority Access to Research Careers, Meyerhof Scholars Program, etc.)? If so, please specify: \_\_\_\_\_
19. What university are you attending? \_\_\_\_\_
20. In what region did you attend undergraduate school? \_\_\_\_\_



## Appendix B - Interview Guide

*[Hello, may I speak to \_\_\_\_\_ please.] This is Tessy Pumacchua; I am a Latina doctoral student from the Psychology Department at the University of Rhode Island. I recently contacted you about participating in a phone interview regarding factors you find supportive and challenging within your doctoral program. Thank you again for agreeing to participate. As noted in the consent form, the information you share in this interview is confidential. Any identifying information will be removed from the transcript and pseudonyms will be used. Moreover, this study is voluntary and you may refuse to answer any questions and/or discontinue the interview at any time. Let's begin.*

(Ensure that equipment is working properly, if technical difficulties arise, re-schedule the interview with the participant.)

*I would like to start this interview by asking you about the supportive factors you have encountered in your academic program....*

1. In your view, what has contributed to your success in your doctoral program?

Probes include:

- a. What personal characteristics or qualities have helped you through this process?
- b. What role has faculty or peer mentoring played in this process?
- c. How has the peer support been in your program?
- d. Have other social support systems in your university, but outside your graduate program, been helpful during this process?
- e. Has your program provided an academic curriculum that has been culturally relevant to you? For example, are cultural issues integrated into classroom materials, discussions, and illustrations?
- f. What about financial aid?

- g. Have you participated in any academic enrichment programs (e.g., McNair Scholars Program, Minority Access to Research Careers, etc.) that have facilitated your success in your doctoral program?
- h. What about support systems outside of school (i.e., family, religion/spirituality, or participation in professional associations)?

*Thank you for those answers. Now, I would like to ask you some questions about the factors that have been challenging in your academic program....*

- 2. In your view, what challenges have you encountered in your doctoral program?

Probes include:

- a. How would you describe your experiences as a person of color on campus?
- b. Have you ever felt isolated in your program, department, or institution?
- c. Tell me about the gender/racial make up in your classes. How has this impacted you?
- d. Do you encounter difficult dialogues on race/ethnicity, sexual orientation, disability, religion, social class, age, immigration, or gender in the classroom or lab settings?
- e. As a person of color have you experienced behavior or language that has made you feel excluded, slighted, or uncomfortable (i.e., racial microaggressions)?

*Thank you for sharing that information with me. Now, I would like to ask you some questions about your various social identities and how they have impacted your educational experiences. Just so we are on the same page, when I say social identities, I am referring to the different group memberships an individual can belong to, such as gender, race/ethnicity, social class, age, religion, sexual orientation, ability, among others.*

3. In your view, how have your various social identities impacted your doctoral educational experiences?

Probes include:

- a. What has been the impact of your *gender*?
- b. What about your *race/ethnicity*?
- c. What has been the impact of your *social class*?
- d. What about your *age*?
- e. If you practice a *religion*, what has been the impact of that?
- f. In terms of *sexual orientation*, how has that impacted your doctoral educational experiences?
- g. What about other social identities, such as *ability/disability, language fluency, immigration status, or any other social identities I did not mention here*? How have they impacted your doctoral educational experiences?

*Thank you for those answers. I just have two final questions before we conclude the interview...*

4. If you were talking to a group of racial/ethnic minority students who just got accepted into your doctoral program, what do you think they should know before they get started? What recommendations would you provide to them to increase their success in the program?
5. Are there other doctoral students of color in STEM programs who you can refer me to for possible participation in this project?

*Thank you very much for sharing your experiences with me. Your input has been very helpful and I appreciate your willingness to participate. As a thank you for your participation, I would like to provide you with a \$25 Amazon gift card. I will send you a follow-up e-mail shortly to set that up. Right now, do I have your e-mail correct? Is it \_\_\_\_\_?*

*Great! Again, thank you very much for taking the time to participate! Have a great rest of the day!*

## Appendix C - Recruitment E-mail/ Recruitment Letter

THE  
UNIVERSITY  
OF RHODE ISLAND  
COLLEGE OF  
ARTS AND SCIENCES

DEPARTMENT OF PSYCHOLOGY  
Chafee Hall, 142 Flagg Road, Kingston, RI 02881 USA p: 401.874.2193 f: 401.874.2157 uri.edu/artsci/psy



The University of Rhode Island  
Psychology Department  
142 Flagg Road  
Kingston, RI 02881  
Phone: (401) 874-2193  
Fax: (401) 874-2157  
Project Title: Challenging and supportive factors encountered by underrepresented minority doctoral students in STEM

Dear \_\_\_\_\_,

I am a doctoral student in the School Psychology program at the University of Rhode Island. As part of my dissertation research project, under the direction of my major professor, Dr. Margaret Rogers, I am conducting a study on **the challenging and supportive factors encountered by underrepresented minority doctoral students in Science, Technology, Engineering, and Mathematics (STEM)**.

I am writing to ask for your time and participation in this research project. If you choose to participate, you will take part in an audiotaped phone or in person interview relating to your graduate school experiences. Any information that is provided will be strictly confidential and your name will not appear in any reports resulting from this study. More specifically, the interview will address questions about the challenging and supportive factors you have encountered in your STEM doctoral program. In addition, there will be questions about how your social identities (e.g., gender, race/ethnicity, social class, ability, sexual orientation, etc.) have impacted your doctoral educational experiences.

The interview is expected to last for approximately 30-45 minutes. I am interested in your unique experiences and I encourage you to freely share them during the interview. A second interview will be scheduled only if supplementary information is needed or if technical difficulties arise during the interview. If you choose to participate, you will be sent a **\$25 Amazon gift card** as a thank you for your time and participation.

Individuals that meet all of the following criteria may be eligible to participate:

- Students who self-identify as Latina/o, African American, or American Indian/Alaska Native.

- Students who have completed at least one year in a doctoral program.
- Students who are pursuing a doctorate in a STEM field of study.
- Students who have a 2.7 grade point average or better.
- Students who attend predominately White institutions in the U.S.

If you meet the above criteria and are interested in participating in this study, please review, sign, and return the attached consent form via e-mail at [pumacchuat@gmail.com](mailto:pumacchuat@gmail.com). I will be setting up interviews shortly. If you have any questions or concerns about this study, you may contact Tessy Pumacchua at (909) 200-0645. You may also contact Dr. Margaret Rogers, Principal Investigator, at [mrogers@uri.edu](mailto:mrogers@uri.edu). This research has been approved by the University of Rhode Island's Institutional Review Board.

Thank you in advance for your time and consideration.

Sincerely,

---

Tessy T. Pumacchua, M.A.  
(909) 200-0645  
[pumacchuat@gmail.com](mailto:pumacchuat@gmail.com)  
Ph.D. Candidate  
School Psychology Program  
University of Rhode Island

---

Margaret Rogers, Ph.D.  
(401) 874-7999  
[mrogers@mail.uri.edu](mailto:mrogers@mail.uri.edu)  
Full Professor  
School Psychology Program  
University of Rhode Island

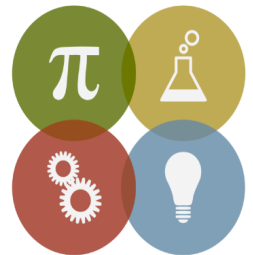
---

UNIVERSITY OF RHODE ISLAND RESEARCH

---

**ATTENTION Graduate Students!**

- **Are you a current doctoral student in a Science, Technology, Engineering, or Mathematics field of study?**
- **Do you self-identify as a Latina/o, African American, or American Indian/Alaska Native?**
- **Have you completed at least 1 year of doctoral work and do you have a 2.7 GPA or above?**
- **Are you currently attending a predominately White higher education institution?**



If the answer to the questions above is a **YES**, then you may be eligible to participate in a dissertation research study about graduate school experiences. Eligible participants will take part in a phone or in person interview lasting approximately 30-45 minutes.

**All participants who successfully complete the study will be awarded a \$25 Amazon gift card!!**

If you think you may qualify, or know someone that does, please contact Tessy Pumacchua through e-mail at [pumacchuat@gmail.com](mailto:pumacchuat@gmail.com) for more information and to schedule an interview.

*Please note that a second interview will be scheduled if supplementary information is needed or in the event technical difficulties arise during the initial interview. This study has been approved by the University of Rhode Island's Institutional Review Board.*

## **Appendix E - Social Media Announcement**

### University of Rhode Island Research

Greetings! My name is Tessy Pumacahua and I am a doctoral student at the University of Rhode Island. As part of my dissertation research project, I am conducting a study on the challenging and supportive factors encountered by underrepresented minority students in Science, Technology, Engineering, and Mathematics (STEM) doctoral programs. I am currently seeking potential participants for this study. Participation in the study will involve the completion of a brief demographic questionnaire, as well as a phone or in-person interview lasting approximately 30-45 minutes about your graduate school experiences. A second interview will only be scheduled if supplementary information is needed or in the event technical difficulties arise during the initial interview. All participants who complete the interview will receive a *\$25 Amazon gift card* as compensation. This study has been approved by the University of Rhode Island's Institutional Review Board. Please see below for specific eligibility criteria. If you believe you may qualify or know someone that does, please e-mail me at [pumacahuat@gmail.com](mailto:pumacahuat@gmail.com). I will be scheduling interviews shortly. Thank you!

Individuals that meet all of the following criteria may be eligible to participate:

- Students who self-identify as Latina/o, African American, or American Indian/Alaska Native.
- Students who have completed at least one year in a doctoral program.
- Students who are pursuing a doctorate in a STEM field of study.



- Students who have a 2.7 grade point average or above.

Students who attend predominately White higher education institutions in the U.S.

## Appendix F – Letter to Academic Enrichment Directors/Program Coordinators

THE  
UNIVERSITY  
OF RHODE ISLAND  
COLLEGE OF  
ARTS AND SCIENCES

DEPARTMENT OF PSYCHOLOGY  
Chafee Hall, 142 Flagg Road, Kingston, RI 02881 USA p: 401.874.2193 f: 401.874.2157 uri.edu/artsci/psy



Dear \_\_\_\_\_,

My name is Tessy Pumacahua and I am currently a doctoral student in the School Psychology program at the University of Rhode Island. As part of my dissertation research project, under the direction of my major professor, Dr. Margaret Rogers, I am conducting a study on **the challenging and supportive factors encountered by underrepresented minority students in Science, Technology, Engineering, and Mathematics (STEM) doctoral programs**. I am contacting to you today to ask you to please consider referring any former students of your program for possible participation in this study.

Participants will take part in an audiotaped phone or in person interview relating to their graduate school experiences. Any information they provide will be strictly confidential and their name will not appear in any reports resulting from the study. More specifically, the interview will address questions about the challenging and supportive factors encountered by STEM doctoral students in their programs. In addition, there will be questions about how their various social identities (e.g., gender, race/ethnicity, social class, ability, sexual orientation, etc.) have impacted their doctoral educational experiences. The interview is expected to last for approximately 30-45 minutes. A second interview will only be scheduled if supplementary information is needed or if technical difficulties arise during the interview. Participants who complete the interview will also receive a \$25 Amazon gift card as a thank you for their participation.

Students that meet the following criteria may be eligible to participate:

- Students who self-identify as **Latina/o, African American, or American Indian/Alaska Native**.
- Students who have completed at least **one** year in a doctoral program.
- Students who are pursuing a doctorate in a **STEM** field of study.
- Students who have a **2.7** grade point average or above.
- Students who attend predominately White institutions in the U.S.

If you could please forward my contact information and the attached flyer to your alumni network, or to any individual that may be interested in participating in this study, I would greatly appreciate it! Please feel free to contact me with any questions you may have. I can be reached at (909) 200-0645 or at

pumacahuat@gmail.com. This research has been approved by the University of Rhode Island's Institutional Review Board.

Thank you for your time and consideration. We appreciate your help!  
Sincerely,

---

Tessy T. Pumacahua, M.A.  
(909) 200-0645  
pumacahuat@gmail.com  
Ph.D. Candidate  
School Psychology Program  
University of Rhode Island

---

Margaret Rogers, Ph.D.  
(401) 874-7999  
mrogers@mail.uri.edu  
Full Professor  
School Psychology Program  
University of Rhode Island

## Appendix G - Consent Form

THE  
UNIVERSITY  
OF RHODE ISLAND  
COLLEGE OF  
ARTS AND SCIENCES



DEPARTMENT OF PSYCHOLOGY  
Chafee Hall, 142 Flagg Road, Kingston, RI 02881 USA p: 401.874.2193 f: 401.874.2157 uri.edu/artsci/psy

The University of Rhode Island  
Psychology Department  
142 Flagg Road  
Kingston, RI 02881  
Phone: (401) 874-2193  
Fax: (401) 874-2157  
Project Title: Challenging and supportive factors encountered by underrepresented minority doctoral students in STEM

Dear \_\_\_\_\_,

### CONSENT FORM FOR RESEARCH

You have been invited to take part in the research project described below. You are free to ask any questions you may have. If you have further questions or concerns, you may contact Tessy Pumacahua at (909) 200-0645. You may also contact Dr. Margaret Rogers, Principal Investigator, at (401) 874-7999.

#### *Description of the project:*

This dissertation research study involves responding to a series of questions regarding your experiences as an underrepresented minority doctoral student in a STEM field of study. More specifically, the interview will address questions about the challenging and supportive factors you have encountered in your doctoral program. In addition, there will be questions about how your social identities (e.g., gender, race/ethnicity, social class, ability, sexual orientation, etc.) have impacted your graduate educational experiences.

#### *What will be done:*

If you decide to participate in this study, you will take part in an audiotaped phone or in person interview lasting about 30-45 minutes. A second interview will only be scheduled if supplementary information is needed or if technical difficulties arise during the interview.

#### *Risks or discomfort:*

The possible risks or discomforts of the study are minimal.

*Benefits of this study:*

If you choose to participate, your answers will help increase the knowledge base about underrepresented minority doctoral student in STEM disciplines and how to best support them.

*Confidentiality:*

Your participation in this study is strictly confidential. This means that none of the information will identify you by name and only pseudonyms will be used. All data will be maintained in a locked and secure facility.

*Decision to quit at any time:*

If you decide to take part in the study, you may choose to withdraw your participation at any time. There are no consequences for not participating in the study, and you are free to refuse to answer any questions.

*Rights and complaints:*

If you have any questions, or if you are not happy about the way in which this study is conducted, you may discuss your complaints with Tessy Pumacahua at (909) 200-0645 or Dr. Margaret Rogers at (401) 874-7999, anonymously, if you choose. In addition, if you have any questions about your rights as a participant, you may contact the office of the Vice President of Research and Economic Development, 70 Lower College Road, Suite 2, University of Rhode Island, Kingston, Rhode Island, telephone: (401) 874-4328.

You have read this Consent Form and your questions have been answered. Your signature on this form means that you understand the information and you agree to participate in this study.

\_\_\_\_\_  
(Signature of interviewee)

\_\_\_\_\_  
(Printed name of interviewee)

\_\_\_\_\_  
(Date)

**Audio Recording:**

I hereby give my consent for audio recording:

\_\_\_\_\_  
(Signature of interviewee)

\_\_\_\_\_  
(Printed name of interviewee)

---

(Date)

**Enclosed are two copies of this consent form. Please keep a copy of this form and return a signed copy to Tessy Pumacahua via e-mail to [pumacahuat@gmail.com](mailto:pumacahuat@gmail.com).**

Thank you for your time and help in this study. Your assistance is greatly appreciated!

## **Appendix H - Statement on Diversity in Research**

This study included the recruitment of participants from racial/ethnic minority backgrounds who are pursuing doctorates in STEM fields at predominately White institutions in the U.S. Specifically, doctoral students from Latino, African American, and American Indian/Alaska Native backgrounds were targeted, as these groups are severely unrepresented in STEM disciplines. Moreover, this study paid close attention to the role of intersectionality on the academic experiences of students of color. As such, diverse factors such as gender, sexual orientation, social class, religion, ability, immigration status, among others were examined and considered in the results of this study.

## BIBLIOGRAPHY

- Alexander, Q. R. (2011). *Adjustment experiences of African American graduates of historically Black colleges or universities attending graduate school at a southern predominantly White university* (Doctoral dissertation, Virginia Polytechnic Institute and State University). Retrieved from [https://theses.lib.vt.edu/theses/available/etd-03082011-110835/unrestricted/Alexander\\_QA\\_D\\_2011\\_2.pdf](https://theses.lib.vt.edu/theses/available/etd-03082011-110835/unrestricted/Alexander_QA_D_2011_2.pdf)
- Aud, S., Fox, M., & Kewalramani, A. (2010). *Status and trends in the education of racial and ethnic groups* (NCES 2010-015). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. doi: 10.1191/1478088706qp063oa
- Brown, C. M., & Dancy, E. T. (2010). Predominantly White institutions. In *Encyclopedia of African American Education*. (2 ed., Vol. 2, pp. 523-526). Thousand Oaks, CA: Sage Publications.
- Camic, P., Rhodes, J., & Yardley, L. (2003). *Qualitative research in psychology: Expanding perspectives in methodology and design* (1st ed.). Washington, DC: American Psychological Association.
- Carlone, H. B., & Johnson, A. (2007). Understanding the science experiences of successful women of color: Science identity as an analytic lens. *Journal of Research in Science Teaching*, 44(8), 1187-1218. doi:10.1002/tea.20237



- Cavanagh, S. (1997). Content analysis: Concepts, methods and applications. *Nurse Researcher*, 4(3), 5-13. doi: 10.7748/nr1997.04.4.3.5.c5869
- Colbeck, C. L., Cabrera, A. F., & Terenzini, P. T. (2001). Learning professional confidence: Linking teaching practices, students' self-perceptions, and gender. *Review of Higher Education*, 42, 324–352. doi:10.1353/rhe.2000.0028
- Correll, S. J. (2001). Gender and the career choice process: The role of biased self-assessments. *American Journal of Sociology*, 106(6), 1722-1723. doi: 10.1086/321299
- Curtis, M. J., Grier, J. E. C., & Hunley, S. A. (2004). The changing face of school psychology: Trends in data and projections for the future. *School Psychology Review*, 33(1), 49-66. doi:10.1521/scpq.18.4.409.26999
- Denson, C. D., Avery, Z. A., & Schell, J. D. (2010). Critical inquiry into urban African American students' perceptions of engineering. *Journal of African American Studies*, 14(1), 61-74. doi:10.1007/s12111-009-9107-4
- Gay, G. (2007). Navigating marginality en route to the professoriate: Graduate students of color learning and living in academia. *International Journal of Qualitative Studies in Education*, 17(2), 265-288. doi:09518390310001653907
- Giordano, P. J., Davis, S. F., & Licht, C. A. (2011). *Your graduate training in psychology: Effective strategies for success*. Thousand Oaks, CA: Sage Publications Inc.
- Grandy, J. (1998). Persistence in science of high-ability minority students: Results of a longitudinal study. *Journal of Higher Education*, 69(6), 589-620. doi:10.2307/2649210

- Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: Concepts, procedures, and measures to achieve trustworthiness. *Nurse Education Today, 24*, 105-112. doi: 10.1016/j.nedt.2003.10.001
- Hurtado, S., Clayton-Pedersen, A. R., Allen, W. R., & Milem, J. F. (1998). Enhancing campus climates for racial/ethnic diversity: Educational policy and practice. *The Review of Higher Education, 21*(3), 279–302. doi:10.1353/rhe.1998.0003
- Koenig, R. (2009). Minority retention rates in science are sore spot for most universities. *Science, 324*, 1386-1387. doi:10.1126/science.324\_1386a
- Kreuter, M. W., Griffith, D. J., Thompson, V., Brownson, R. C., McClure, S., Scharff, D. P., & Haire-Joshu, D. (2011). Lessons learned from a decade of focused recruitment and training to develop minority public health professionals. *American Journal of Public Health, 101*(1), 188–195. doi:10.2105/AJPH.2011.300122
- Kvale, S. (1996). *Interviews: An introduction to qualitative research interviewing*. Thousand Oaks, CA: Sage.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.
- MacLachlan, A. J. (2006). The graduate experience of women in STEM and how it could be improved. In J. M. Bystydzienski & R. S. Bird (Eds.), *Removing barriers: Women in academic science, technology, engineering, and mathematics* (pp. 237-253). Bloomington, IN: Indiana University Press.
- MacLachlan, A. J. (2006). *Developing graduate students of color for the professoriate*

*in science, technology, engineering and mathematics* (Report No. CSHE.6.06).

Retrieved from University of California Berkeley, Center for Studies in Higher Education website: <https://cshe.berkeley.edu/sites/default/files/publications/rop.maclachlan.6.06.pdf>

Malcolm, S. M., Hall, P. Q., & Brown, J. W. (1976). *The double bind: The price of being a minority women in science* (No. 76-R-3). Washington, D.C.: American Association for the Advancement of Science.

Maton, K. I., & Hrabowski III, A. F. (2004). Increasing the number of African American Ph.Ds in the sciences and engineering: A strengths-based approach. *American Psychologist*, *59*(6), 547-556. doi:10.1037/003-066x.59.6.547

Maton, K. I., Pollard, S. A., McDougall Weise, T. V., & Hrabowski III, F. A. (2012). The Meyerhoff scholars program: A strengths-based, institution-wide approach to increasing diversity in science, technology, engineering and mathematics. *Mount Sinai Journal of Medicine*, *79*(5), 610-623. doi:10.1002/msj.21341

McCall, L. (2005). The complexity of intersectionality. *Signs*, *30*(3), 1771–1800. doi:10.1086/426800

Meeuwisse, M., Born, M. P., & Severiens, S. E. (2014). The family-study interface and academic outcomes: Differences and similarities between ethnic minority and ethnic majority students. *Cultural Diversity & Ethnic Minority Psychology*, *20*(3), 401–412. doi:10.1037/a0036698.

Meier, D. (2002). *The power of their ideas: Lessons for America from a small school in Harlem*. Boston, MA: Beacon Press.

National Association of School Psychologists. (2017). *Shortages in school*

- psychology: Challenges to meeting the growing needs of U.S. students and schools* [Research summary]. Bethesda, MD: Author. Retrieved from [http://www.nasponline.org/Documents/Resources%20and%20publications/Resources/School\\_Psychology\\_Shortage\\_2017.pdf](http://www.nasponline.org/Documents/Resources%20and%20publications/Resources/School_Psychology_Shortage_2017.pdf)
- National Center for Education Statistics. (2017). *Fast facts on back to school statistics for 2017*. Retrieved from <https://nces.ed.gov/fastfacts/display.asp?id=372>
- National Science Foundation. (2015). *Women, minorities, and persons with disabilities in science and engineering*. Arlington, VA: National Science Foundation.
- National Academy of Sciences. (2011). *Expanding underrepresented minority participation*. Washington, DC: The National Academies Press.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Thousand Oaks, CA: Sage.
- Robinson, M. D. (2012). *The perceived relationship between wellness and microaggressions in African American and Latina American female doctoral students in counselor education programs* (Doctoral dissertation). Retrieved from [http://scholarworks.gsu.edu/cgi/viewcontent.cgi?article=1071&context=cps\\_diss](http://scholarworks.gsu.edu/cgi/viewcontent.cgi?article=1071&context=cps_diss)
- Rogers, M. R. & Molina, L. E. (2006). Exemplary efforts in psychology to recruit and retain graduate students of color. *American Psychologist*, *61*(2), 143-156. doi:10.1037/0003-066X.61.2.143
- Ross, T., Kena, G., Rathbun, A., Kewalramani, A., Zhang, J., Kristapovich, P., &

- Manning, E. (2012). *Higher education: Gaps in access and persistence study* (NCES 2012-046). U.S. Department of Education, National Center for Education Statistics. Washington, DC: Government Printing Office.
- Sandelowski, M. (2000). Whatever happened to qualitative description? *Research in Nursing and Health*, 23, 334-340. doi:10.1002/1098-240X(200008)23;4%3C334::AID-NUR9%3E3.0.CO;2-G
- Seidman, I. (2006). *Interviewing as qualitative research: A guide for researchers in education and the social sciences*. New York, NY: Teachers College Press.
- Shah, P. (2008). *Coping with perceived racial and ethnic discrimination in women of color in graduate education* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3201011)
- Solorzono, D., Ceja, M., & Yosso, T. (2000). Critical race theory, racial microaggressions, and campus racial climate: The experiences of African American college students. *The Journal of Negro Education*, 69, 60-73.
- Strayhorn, T. L., Long III, L. L., Kitchen, J. A., Williams, M. S., & Stentz, M. E. (2013). *Academic and social barriers to Black and Latino male collegians' success in engineering and related STEM fields*. Paper presented at the American Society for Engineering Education Annual Conference and Exposition, Atlanta, GA.
- Sue, D. W., Capodilupo, C. M., Torino, G. C., Bucceri, J. M., Holder, A. M. B., Nadal, K. L., & Esquilin, M. (2007). Racial microaggressions in everyday life: Implications for clinical practice. *American Psychologist*, 62(4), 271-286. doi:10.1037/0003-066X.62.4.271

- Sue, D. W., Capodilupo, C. M., & Holder, A. M. B. (2008). Racial microaggressions in the life experience of Black Americans. *Professional Psychology: Research and Practice, 39*(3), 329- 336. doi:10.1037/0735-7028.39.3.329
- Sue, D. W., Lin, A. I., Torino, G. C., Capodilupo, C. M., & Rivera, D. P. (2009). Racial microaggressions and difficult dialogues on race in the classroom. *Cultural Diversity and Ethnic Minority Psychology, 15*(2), 183-190. doi:10.1037/a0014191
- Swail, W. S., Redd, K. E., & Perna, L. W. (2003). *Retaining minority students in higher education: A framework for success*. (ASHE-ERIC Higher Education Report No. 2). Washington, DC: The George Washington University.
- Thompson, G. L. (1998). *Predictors of resilience in African-American adults*. Claremont, CA: Graduate University Press.
- Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago, IL: University of Chicago Press.
- Torres, L., Driscoll, M. W., & Burrow, A. L. (2010). Racial microaggressions and psychological functioning among high achieving African-Americans: A mixed-methods approach. *Journal of Social and Clinical Psychology, 29*(10), 1074-1099. doi:10.1521/jscp.2010.29.10.1074
- U.S. Census Bureau. (2015). *Projections of the size and composition of the U.S. population: 2014 to 2060*. Retrieved from <https://www.census.gov/content/dam/Census/library/publications/2015/demo/p25-1143.pdf>
- U.S. Department of Education. (2015). *Science, technology, engineering, and math: Education for global leadership*. Washington, DC: Author.

- Villegas, A. M., & Lucas, T. (2002). Preparing culturally responsive teachers: Rethinking the curriculum. *Journal of Teacher Education*, 53(13), 20-32.  
doi:10.1177/0022487102053001003
- White, M. D., & Marsh, E. E. (2006). Content analysis: A flexible methodology. *Library Trends*, 55, 22-45. doi: 10.1353/lib.2006.0053
- Willig, C. (2001). *Introducing qualitative research in psychology*. Philadelphia, PA: Open University Press.
- Yates, T. M., & Masten, A. S. (2004). Fostering the future: Resilience theory and the practice of positive psychology. In P. A. Linley & S. Joseph (Eds.), *Positive Psychology in Practice* (pp. 521–539). Hoboken, NJ: John Wiley & Sons Inc.
- Yosso, T. J., Smith, W. A., Ceja, M., & Solorzano, D. G. (2000). Critical race theory, racial microaggressions, and campus racial climate for Latina/o undergraduates. *Harvard Educational Review*, 79(4), 659-690.  
doi:10.17763/haer.79.4.m6867014157m7071
- Zea, M. C., Reisen, C. A., Beil, C., & Caplan, R. D. (1997). Predicting intention to remain in college among ethnic minority and nonminority students. *Journal of Social Psychology*, 137, 149–160. doi:10.1080/00224549709595426
- Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal*, 29(3), 663–676.  
doi:10.3102/00028312029003663