

Institutional Support, Mentor Sponsorship, Department Climate, and Social Identities:  
Factors in Developing Academic Confidence of Doctoral Students

by

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A dissertation submitted in partial fulfillment  
of the requirements for the degree of  
Doctor of Philosophy  
(Psychology and Women's Studies)  
in the University of Michigan  
2016

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Dedication

To my beloved parents.

## Acknowledgements

First and foremost, I would like to take this opportunity to thank my academic advisor and dissertation chair, Dr. Abby Stewart, for her unrelenting support and guidance in all aspects of this dissertation. It has been an absolute privilege to know her, work with her, and learn from her. Her knowledge, mentorship, and commitment are truly remarkable. Thank you, Abby, for being there every step of the way and helping me throughout my graduate career. I am a better researcher, teacher, and person because of you and I am truly deeply indebted to you.

I would also like to express my gratitude to my other mentors and committee members – Dr. Denise Sekaquaptewa, Dr. Janet Malley, and Dr. Wang Zheng. I am more than grateful for all their feedback and contributions throughout my dissertating process. Each of them has been providing me with advice and support in any way possible since the very early stage of my doctoral career. Many thanks for your patience and kindness. Those mentoring moments I had with each of you were thought-provoking, soothing, and inspiring and will never be forgotten.

In addition, I thank other faculty members, staff and graduate students, without whom I could not have gone this far; Dr. Ram Mahalingam, whose support and encouragement has been a true gift to me; Dr. Elizabeth Wingrove, who provided important feedback for my dissertation prospectus despite her busy schedule; the ADVANCE team, especially former research staff member Keith Rainwater; and my fellow graduate students in Abby's Gender and Personality in Context lab and Denise's Stereotypes and Prejudice Research Interest Group (SPRIG) lab who are incredibly intelligent and sincere and I am grateful for the time I had with them.

Lastly, I could not have completed this dissertation without the continuous support from

my friends and family. Special thanks to my besties in graduate school, Weimin and Ziyong, thank you for always being there for me even when you were having a hard time in your own life. And to my dearest parents – I love you and I hope I have made you proud.

## TABLE OF CONTENTS

DEDICATION.....	ii
ACKNOWLEDGEMENTS.....	iii
LIST OF TABLES.....	vii
LIST OF FIGURES.....	viii
LIST OF APPENDICES.....	ix
ABSTRACT.....	x
CHAPTER 1: INTRODUCTION.....	1
Academic Confidence.....	2
Opportunities for Socialization in Graduate School.....	3
Marginalized Social Identities in the U.S. Academy.....	19
Current Study.....	25
CHAPTER 2: METHOD.....	35
Participants and Procedure.....	35
Measures.....	37
Analyses.....	44
CHAPTER 3: RESULTS.....	47
Preliminary Analyses.....	47
Analyses of Variance (ANOVAs) .....	48
Saturated Model and Hypothesized Model.....	53

Alternative Models.....	56
Multigroup Analysis.....	57
CHAPTER 4: DISCUSSION.....	63
Group Differences on Variables of Interest.....	63
Socializing Features of Graduate Experience.....	67
Considerations of the Conceptual Model.....	70
Implications for Doctoral Education.....	73
Limitations and Future Directions.....	74
APPENDICES.....	95
REFERENCES.....	114

## LIST OF TABLES

Table 1: Descriptive Statistics and Bivariate Correlations among All Variables.....	78
Table 2: Comparing Groups Differing on One Identity on Graduate Experience Variables.....	79
Table 3: Intersectional Comparisons by Gender, URM Status, and International Status.....	80
Table 4: Comparisons of Academic Confidence by Gender and URM Status.....	81
Table 5: Intersectional Comparisons of Academic Confidence by Gender and URM Status.....	81
Table 6: Comparison of Department Climate by Field of Study.....	82
Table 7: Comparing Graduate Experience Variables and Academic Confidence by Field of Study.....	82
Table 8: Intersectional Group Comparisons of Graduate Experience Variables and Academic Confidence by Field of Study.....	83
Table 9: Comparison of Importance of Graduate Experience by International Status.....	83
Table 10: Standardized Coefficients and Significance Levels for the Hypothesized Model.....	84
Table 11: Standardized Path Coefficients from Covariates to Variables of Interest.....	85

## LIST OF FIGURES

Figure 1: Hypothesized Model.....	86
Figure 2: Hypothesized Model with Standardized Coefficients for All Participants.....	87
Figure 3: Hypothesized Model with Standardized Coefficients for Male and Female Participants.....	88
Figure 4: Hypothesized Model with Standardized Coefficients for Non-URM and URM Participants.....	89
Figure 5: Hypothesized Model with Standardized Coefficients for Non-international and International Participants.....	90
Figure 6: Hypothesized Model with Standardized Coefficients for International Male and International Female Participants.....	91
Figure 7: Hypothesized Model with Standardized Coefficients for Non-STEM and STEM Participants.....	92
Figure 8: Hypothesized Model with Standardized Coefficients for STEM Male and STEM Female Participants.....	93
Figure 9: Hypothesized Model with Standardized Coefficients for STEM Non-international and STEM International Participants.....	94

## LIST OF APPENDICES

Appendix A: Institutional Support Items.....	95
Appendix B: Mentor Sponsorship Items.....	96
Appendix C: Department Climate Items.....	97
Appendix D: Group-Based Experience Items.....	98
Appendix E: Academic Confidence Items.....	99
Appendix F: Importance of Graduate Experiences Items.....	100
Appendix G: Original Climate Survey (Screenshot Version).....	101

## Abstract

This dissertation examined the extent to which aspects of socialization in graduate school (i.e., institutional support, mentor sponsorship, and department climate), as well as individual factors (i.e., perceived importance of graduate experiences and group-based experiences), related to one another, and together predicted doctoral students' academic confidence. Theoretically grounded in *social identity theory* and the theory of *intersectionality*, this study also aimed to assess whether an intersectional lens facilitates understanding how having multiple minority social identities relates to students' graduate experiences and their academic confidence differently than having only one. Participants in the study were doctoral students from a large Midwestern research public university who completed the Graduate Student Climate Survey between 2009 and 2015.

Structural equation modeling results indicated that proposed relationships among variables generally held true for all participants ( $n = 1066$ ) regardless of gender, URM status, international status, and field of study. Specifically, institutional support, mentor sponsorship, and department climate were all positive predictors of academic confidence. Institutional support and mentor sponsorship were positively associated with each other, and both predicted department climate. Department climate was also a strong predictor of negative group-based experiences that students with more positive perceptions of department climate reported fewer negative group-based experiences.

Additionally, results from multigroup analyses suggested that most of the predicted associations held for subsamples of interest, suggesting that the proposed links among elements

of graduate socialization and academic confidence were generally applicable across groups. At the same time, average levels of group scores on key variables revealed that students with marginalized social identities reported more negative perceptions of socialization and group-based experiences, as well as less academic confidence than those with privileged identities.

Limitations of the present study, as well as future directions, are discussed. Implications for doctoral education policies and practices are also outlined.

## **Chapter 1: Introduction**

In the United States, doctoral education represents a significant investment of time and money for individuals and for institutions. Not only does the individual student commit to a lengthy process (typically five to eight years, with variations across disciplines), but also to limited financial income for that period (Council of Graduate School, 2010; National Science Foundation, 2009). Faculty advisors commit to a lengthy process of mentoring students to completion, and institutions generally commit significant financial resources to the process (for example it is currently \$20,966 for in-state students and \$42,016 for out-of-state and international students at the research institution in this study). Because it is such a large investment of time and resources both at the individual- and institutional-level, the probability of successful doctoral degree completion is an important outcome.

Kuh and colleagues (2006) conducted a review and found that five elements are particularly important to success in doctoral programs, including 1) academic foundation, 2) financial resources, 3) confidence and motivation, 4) administrative support, and 5) opportunities for socialization. In a highly-selective institution like the one in my study, all doctoral students meet a necessary standard of academic foundation, and financial resources to support their study are guaranteed to all students (though of course students arrive with variable debt and family resources behind them). Academic confidence, and aspects of socialization (including institutional support, sponsorship from mentors, and academic climate) are the focus of the present study, which seeks to identify some of the institutional-level factors that are most strongly associated with good outcomes for different doctoral students.

## *Academic Confidence*

Academic confidence refers to students' self-perceptions of their academic abilities (Berg & Ferber, 1983; Felder, Felder, Mauney, Hamrin, & Dietz, 1995); it is sometimes used interchangeably with other terms such as *academic self-concept* (e.g., Lent, Brown, & Gore, 1997; Ostrove, Stewart, & Curtin, 2001) and *academic self-esteem* (e.g., Brush, 1991; Widnall, 1988) in the literature. For the purposes of this study, I use the term *academic confidence* to refer to this theoretical construct. Academic confidence has been found to be associated with many factors that are important to students and educators, including academic performance, academic and career choices, attrition and retention, psychological well-being, and so forth (e.g., Austin, 2002; Curtin, Stewart, & Ostrove, 2013; Hurtado, 1994; Ostrove et al., 2001; Settles, Cortina, Malley, & Stewart, 2006).

Research conducted at the undergraduate and graduate levels has shown that despite objective evidence of equivalence in prior academic aptitude and performance, group differences exist in terms of perceptions of academic confidence. Female and underrepresented racial minority (URM) students tend to have lower academic confidence than their White male peers (Berg & Ferber, 1983; Felder et al., 1995; Jackson, Gardner, & Sullivan, 1993). Two studies of graduate science and engineering students reported significant gender differences, favoring males, in students' academic self-confidence (Etzkowitz, Kemelgor, Neuschatz, & Uzzi, 1992; Zappert & Stansbury, 1984). In one study focusing on Latino and Black students across a variety of graduate programs, similar gender differences were found in students' self-reported academic confidence, both at the time of program entry and in a follow-up study nine years later (Hurtado, 1994). There has not been much empirical data on the comparison of international versus domestic graduate students; however, a previous study conducted at the current institution found

that controlling for gender, ethnicity, and field of study, international doctoral students had higher academic confidence than domestic students (Curtin et al., 2013).

### ***Opportunities for Socialization in Graduate School***

Academic confidence is also perceived as facilitated by the process of socialization (Austin, 2002; Austin & McDaniels, 2006; Lovitts, 2001). To unpack the graduate socialization experience, one line of theories builds on the traditional work of social theory and social structure (Merton, 1957), which assumes the stability of culture and a linear or stage-based process through which newcomers learn about the organization (e.g., Braxton & Baird, 2001; Kirk & Todd-Mancillas, 1991; Tierney, 1997). In the context of graduate school, it is suggested that the graduate career has a “beginning” stage, in which students become familiar with different perspectives in the field, learn about the focus of the program, form a group of peers and future colleagues, and locate a faculty advisor. During the “middle” stage, students become competent with research methods, specify their intellectual and professional interests, and get ready for the qualifying exams. The dissertation process is the third and last stage, during which students acquire guidance, advice, and encouragement to move forward (Braxton & Baird, 2001; Kirk & Todd-Mancillas, 1991).

In relation to doctoral students, socialization is crucial to a successful graduate school experience in many ways (Clark & Corcoran, 1986). Prior research suggests that unsuccessful socialization contributes to the decision to leave the graduate program (Council of Graduate Schools, 2010; Gardner, 2010). On the other hand, successful socialization in graduate school has been shown to have a positive influence on students’ sense of belonging (Austin, 2002), which in turn enhances their academic confidence (Ostrove, et al., 2011) and academic career aspirations and commitment (Bieber & Worley, 2006; Ülku-Steiner, Kurtz-Costes, & Kinlaw,

2000). Another set of theories adopts a nonlinear, and culturally-based view of socialization that emphasizes the “ongoing” feature of socialization (Austin, 2002, p. 103; Tierney, 1997). This perspective recognizes that the interactions newcomers have with others in the academy have the potential to both shape the experiences of the newcomers and change the existing cultural norms of the academy. Research has shown that women and racial minorities often have experienced difficulties entering and establishing themselves in the academy (Turner & Thompson, 1993). To insist that all newcomers to the academy learn and adapt to the dominant cultural norms (as suggested by the linear or stage-based theory of socialization) will perpetuate these concerns. Along with the linear approach, this second approach may help us understand the experiences of women, underrepresented minorities and international students in the academy.

Considering the fact that doctoral students are constantly interacting with their surroundings as they develop, socialization during the graduate career is a complex process that depends on a number of factors. In this proposed study, I am particularly interested in focusing on three aspects of socialization in graduate school: the effectiveness of institutional support, the role of mentor sponsorship, and the impact of academic climate. *Institutional support* in the form of resources and opportunities enriches doctoral students’ socialization experiences as it helps students establish themselves as scholars and professionals (Wulff & Austin, 2004). *Sponsorship from mentors*, as a unique type of support, provides doctoral students with nonmaterial but invaluable resources that can promote their visibility and exposure within their academic field (Eby et al., 2013). *Academic climate*, or the general atmosphere of one’s academic environment (e.g., campus, department, and discipline), is an important factor contributing to the graduate socialization experiences of doctoral students. Though academic climate can be assessed on multiple dimensions, past research has indicated that a “chilly,” unwelcoming, and challenging

academic climate can make the socialization experience especially difficult for White women and racial minorities (August & Waltman, 2004; Hurtado, 1994).

The socialization experiences in graduate school for doctoral students differ somewhat by discipline. Golde (2005) argues that the discipline or academic field, and its location in the university through a department, is the locus of the doctoral experience. Disciplines vary in the research questions, methodologies, forms of scholarly contributions that are valued, the dynamics between teaching and research, the way mentorship is delivered, and the patterns of interaction among students and faculty members. The socialization experiences in the sciences and engineering, based in laboratory or field work and experiments conducted in research teams, is quite different from the independent scholarship conducted in the humanities (Austin & McDaniels, 2006; Gardner, 2007; Golde, 2005). For instance, a faculty member in the humanities (and some social science disciplines such as anthropology) usually conducts research alone and produces books or chapters, whereas his or her colleagues in STEM (science, technology, engineering and mathematics) fields such as chemistry are likely to work with a research team and submit research articles to journals (Gardner, 2007). Given these variations, processes and outcomes of graduate socialization are significantly shaped by the particular disciplinary context (Austin, 2002; Biglan, 1973; Clark, 1987; Gardner, 2010). Therefore, in the current study, in addition to understanding students' experience across the institution, I will compare students in STEM to those in non-STEM fields to further explore how broad disciplinary contexts may play a role in their graduate experience. The STEM versus non-STEM division makes sense as a grouping variable instead of narrower disciplinary categories based on three major considerations.

First, STEM disciplines in the U.S. are known for having a demographic composition that

includes disparities in STEM education and employment by gender and race that are significantly larger than in non-STEM fields. Concerning postsecondary education attainment, male students are about twice as likely as female students to enter STEM fields. Approximately twice as many Asian as White, Black, or Hispanic students enter STEM fields. Completion rates are lowest for Black and Hispanic students (16%) compared to those for the Asian and White students (30%) who enter these fields earning bachelor's degrees in these fields (National Center for Education Statistics, 2001). In the workforce (in which women account for 47% of the population), among science and engineering graduates, men are employed in STEM occupations at twice the rate of women; moreover, 20% of female science and engineering graduates are out of the labor force, compared with less than 10% of male science and engineering graduates. With respect to racial disparities, White and Asian populations are overrepresented among STEM employers, whereas Blacks and Hispanic have been consistently underrepresented in STEM employment. In 2011, about 67% of the total workforce was White, but they held 71% of STEM jobs; Asians held 15% of the STEM jobs, compared with 6% of all jobs. At the same time, 11% of the workforce was Black, while 6% of STEM workers were Black; Hispanics held 7% of the STEM jobs in 2011, despite the fact that they constituted 15% of the U.S. workforce (Landivar, 2013; U.S. Census Bureau, 2010, 2011).

Aside from the demographic composition, STEM disciplines also use research and learning approaches that are different from many other fields. The National Research Council suggests that STEM education adopts an applied approach that is coupled with hands-on, problem-based learning because subjects in STEM are often deeply intertwined with practical issues and problems (Honey, Pearson, & Schweingruber, 2014). As described above, research in STEM is often based in laboratory and field studies and experiments conducted in research teams,

which differs from the independent scholarship conducted in the humanities and many other non-STEM disciplines (Gardner, 2007; Golde, 2005). Thus, STEM fields are more focused on practical, real-world problems at least in the long-term view, and they are more likely to be studied in collaborative laboratory work settings.

Lastly, how mentorship is delivered can vary between STEM and non-STEM disciplines. Whereas the central aspect of the mentoring relationship in lab-based STEM disciplines relies on the research lab, with the primary advisor as the “boss” or “supervisor” to the larger group of students, the nucleus of the mentoring experience in individual-based non-STEM disciplines is the quality of the relationship the doctoral student has with his or her advisor one-on-one (Gardner, 2007). Gardner (2007) argues that the mentorship model in the context of academic research can influence students’ perceptions of independence which may also affect their demands and expectations of institutional support.

*The role of institutional support in the graduate experience.* As mentioned in the previous section, institutional support is one of the three components of graduate socialization that I aim to explore in this study.

The primary type of institutional support doctoral students expect and look for during their time in graduate school are *academic resources* afforded by their doctoral programs or departments (Golde, 2005). Being a productive researcher and scholar requires different skills in different disciplines. In a survey of doctoral candidates, Kluever (1997) found that a number of students reported that conducting research was a relatively new experience for them. This situation is problematic for several reasons, as lack of research experience and skills reduces opportunities for intellectual growth in graduate school, undermines one’s ability to produce research findings and publications, and, for many, impairs their employment outcomes upon

graduation. Studies have found that doctoral students actively involved in research projects and training have more interactions with faculty members (which may lead to more opportunities for mentoring and sponsorship), are more productive during their doctoral career, and complete PhD degrees at a higher rate (de Valero, 2001; Golder, 2005; Grunig, 1997).

Given the fact that one significant goal of academic socialization for doctoral students is to prepare them for the future professoriate, research on institutional support for graduate experience suggests that *opportunities and resources for teaching* provides meaningful training for PhD students as aspiring faculty (Wulff & Austin, 2004). However, as Austin (2002) noted, although teaching responsibilities can undoubtedly offer training opportunities to students, these positions are sometimes structured more to serve institutional or faculty needs than to ensure growth and appropriate preparation for graduate students who aspire to the professoriate. By surveying a group of doctoral students at twenty-eight major research institutions, Golde and Dore (2001) discovered that participants who were interested in faculty careers were concerned that their graduate training primarily focused on research and publishing, and did not adequately prepare them for the teaching aspects of the jobs they would like to take. Therefore, developing systematic preparation programs to help graduate students take on increasingly complex and more autonomous teaching responsibilities was a recommended approach for institutions to pursue (Austin, 2002).

Experiences as graduate researchers and instructors can provide doctoral students with learning opportunities and academic confidence both in terms of research and teaching. Many doctoral students believed that their *research experiences in graduate school* gave them confidence in their ability to frame research questions, design studies, analyze results, interpret findings, and write for publication (Austin, 2002). Teaching assignments that require graduate

students to master the subject matter and the corresponding pedagogy, can also contribute to students' ability to integrate into the academic community and gain confidence as aspiring faculty (Wulff & Austin, 2004).

Sufficient opportunities for both research and teaching also contribute to doctoral students' commitment and retention intentions as professionals in the field. Lovitts (2004) found that individuals who completed PhDs were more likely than non-completers to hold research and teaching assistantships. In addition, people who had research and teaching assignments as part of their funding package were also more likely to complete the program than those who were awarded fellowships but did not have the assistantship responsibilities.

In combination with gaining academic research and teaching skills, *professional development* has become an integral element of graduate experience. Professional development has increasingly served as a topic of graduate seminars and professional workshops, and has become identified with the process of maturing and evolving as a professional in one's field (Devitt, 1988; Gardner, 2009). Rose (2013) defined professional development as "the acquisition of competencies which have to do with self-development, self-management, self-presentation, communicating effectively to targeted audiences" (p. 5), and above all the ability to translate their knowledge, experience, achievements, and competencies into language that can be understood and valued by potential employers both inside and outside of the academia.

Olsen (1998) contended that graduate programs and departments could "enhance the competitive strength of their graduates by meeting the needs of the bread-and-butter positions" (p. 502). Austin (2002) also highlighted the need for reform of graduate student professional development at the institutional and departmental level, which may be especially needed since full-time tenure-track positions have become increasingly difficult to obtain. The precise

statistics vary by academic discipline; however, across disciplines, new doctoral graduates are facing a decline in tenure-track positions and an increase in part-time and non-tenure-track full-time positions (Finkelstein, Seal, & Schuster, 1998; Laurence, 2013; Schuster, 1999).

Although the Preparing Future Faculty Program (Gaff, Pruitt-Logan, & Weibl, 2000) and others like it offer a good example of how doctoral programs in research universities can partner with other colleges and universities to address these professional development needs, many doctoral students have little exposure to the differing faculty cultures and expectations across institutional types and thus do not feel confident and prepared about their future careers (Austin, 2002). Davis and Fiske (2000) found that 37% percent of their respondents reported receiving little guidance for academic careers; less than one-half received guidance about nonacademic careers. Therefore, providing doctoral students with more continuous and systematic opportunities for professional development may be essential to fostering their career aspirations and increasing their job opportunities (Austin, 2002; Gaff et al., 2000).

Moreover, as mentioned earlier, access to *administrative support* is considered a key institutional (and departmental) factor predicting doctoral student success (Bowen, 2005; Kuh et al., 2006). As students enter into PhD programs as newcomers to the discipline and the institution, they experience both the transition to a new academic environment as well as a great deal of ambiguity regarding the expectations for their doctoral career. The ambiguity may become a source of stress if the students feel directionless and thus unmotivated during the transition. Administrative support, as Gardner (2010) stated, may help students alleviate some of the ambiguity and mitigate the negative feelings within this experience through clear expectations and well-established guidelines. Besides, administrative support can also facilitate students' progress throughout their graduate career by providing them with clarifications and

suggestions for difficult tasks and situations.

Further, doctoral education is known as a long and often isolating life experience with numerous challenges. Studies have documented that long hours working in an isolated research or study site (e.g., laboratory, library) can strain social relationships and cause mental health problems for graduate students (Benton, 2003; Hyun, Quinn, Madon, & Lustig, 2006; Johnson & Huwe, 2002). Hyun et al. (2006) in a survey study disclosed that almost half of graduate student respondents reported having had an emotional or stress-related problem over the previous year; students who reported having more functional relationships with their administrative staff were more likely to use mental health services provided by the institution. Hence, the support from administrative staff who are willing to direct their students enrolled in academic programs to appropriate institutional services is important for doctoral student in distress.

In terms of group and field differences in perceptions of institutional support, research suggests that women, underrepresented minorities, and international people have more difficulties getting the support they are looking for. Prior research indicates that women and racial minorities in the academy generally report having access to fewer resources than their White male peers in terms of research equipment and financial support (e.g., August & Waltman, 2004; Olsen, Maple, & Stage, 1995). Regardless of field, Smith (1995) noted that women doctoral students are less likely than men to receive research assistantships.

International doctoral students also report that they do not receive adequate support and guidance from their department concerning balancing research and teaching responsibilities or managing their time effectively. Sato and Hoge (2009) revealed that the concern about fulfilling multiple demands created stress for international doctoral students because they believed that, if any of their responsibilities were not carried out satisfactorily, they risked losing their

opportunities as graduate research or teaching assistants or even dismissal from their academic programs and loss of their visas. Consequently, some students would spend a lot of time working in their research lab and preparing to teach, and felt isolated from their cohorts and unrecognized by their department (Spurling, 2006).

In the fields of science and engineering, women and URM doctoral students were concerned that the laboratory-oriented graduate training they received from their academic program did not prepare them for the multiple roles they might encounter upon graduation (Jeage, Haley, Ampaw, & Levin, 2013). Research suggests that providing women and URM doctoral students with professional development and cross-training opportunities would afford them insights to keep a work-life balance as future faculty (as minorities in the field), and knowledge about professions in various career sectors (Austin & McDaniels, 2006; Jeager et al., 2013; Mason, Goulden, & Frasch, 2009). On the other hand, international STEM doctoral students expressed more concerns related to the academic resources aspect of the institutional support; they commented on issues that permeated their graduate experiences, including the lack of diversity in their curriculum, the quality of available training, and shortages and turnover of faculty members in their academic unit (Le & Gardner, 2010).

***Mentor sponsorship as a unique type of support.*** Contemporary doctoral programs emphasize the apprenticeship relationship established between a doctoral student and his or her primary academic advisor or mentor (Tenenbaum, Crosby & Gliner, 2001; Zhao, Golde & McCormick, 2007). Thus, the mentoring relationship is a crucial source of socialization for doctoral students. In fact, the quality of the mentoring relationship has been shown to have a positive effect on students' satisfaction (Zhao et al., 2007) and success (Lovitts, 2001). Graduate students who reported that they had received more mentor support were also found to be more

productive and enthusiastic about their academic field (Knox & McGovern, 1988; Paglis, Green, & Bauer, 2006), and less likely to leave the field or the program (Golde, 2005; Jacks et al., 1983).

Eby and colleagues (2013), in a meta-analysis summarizing academic, workplace, and youth mentoring relationships, suggest that three forms of mentoring (instrumental support, psychosocial support, and sponsorship) are critical to mentee success in occupational contexts, but have not often been differentiated in research on mentoring in academic settings. Following the three-factor structure of academic mentoring (Tenenbaum et al., 2001), Curtin, Malley and Stewart (2016) demonstrated that all three types of mentoring were significant predictors of doctoral students' desires and confidence to pursue an academic career. However, it is noticeable that among studies that have differentiated the forms of mentoring in academic settings, more attention has been paid to the instrumental and psychosocial aspects of mentoring (e.g., Blake-Beard, Bayne, Crosby & Muller, 2011; McKeen & Bujaki, 2007; Noe, 1988) than the area of sponsorship.

The broad definition of sponsorship may be one of the reasons that researchers have not looked into it as a specific component of mentoring. In everyday discourse (that is not mentoring-related), the term sponsorship often signals the act of supporting someone or something *financially*. However, in the context of mentoring, Eby et al. (2013) noted that a perspective that looks at the investments mentors make in their mentees (which I refer to as *mentor sponsorship* in the current study) should be adopted to help understand the meaning of sponsorship here. Sponsorship can be received from many sources. Students can obtain sponsorship from their identified mentors such as their primary and secondary academic advisors, other faculty members, senior graduate students, research scientists, and cohorts. The notion of sponsorship argues that the investments in time, energy, and resources made by

individuals in developing skills and abilities are typically acquired through education, but also talents, training, and practical experience (Wayne, Liden, Kraimer, & Graf, 1999).

To help understand how *mentor sponsorship* functions in the graduate experience, Ibarra, Carter, and Silva (2010) offered a definition based on data collected from a large-scale survey and in-depth interviews. According to their report, mentor sponsorship is a unique type of support in which “the mentor goes beyond giving feedback and advice” and uses his or her influence to advocate for the mentee (p. 82). Mentor sponsorship differs from “classical mentoring” (which consists of instrumental and psychosocial support) in that only mentor-sponsors actively advocate for *advancement* of their mentees (Ibarra et al., 2010, p. 84). Eby et al. (2013) summarized that specific activities of mentor sponsorship in the context of doctoral experience may include promoting the mentee’s visibility and exposure within the field or the discipline, building opportunities for research collaboration, creating access to one’s professional network, recommending the mentee to others (actively), nominating the mentee for awards and fellowships, and advocating for the mentee (e.g., Cameron & Blackburn, 1981; Chow & Chan, 2008; Ibarra et al., 2010).

Mentor sponsorship is related both to doctoral students’ academic confidence and productivity, as well as long-term professional success. In terms of academic-related outcomes, Curtin et al. (2016) discovered that mentor sponsorship was significantly associated with increased confidence about academic careers among doctoral students. Tenenbaum et al. (2001) found that sponsorship was related to student’ productivity (measured by the number of publications or conference talks). In addition, research suggests that in academic mentoring relationships, mentor sponsorship may help mentees create and maintain their social capital (i.e., professional networks in academia), which benefits their careers and professional development

over time (Coleman, 1988, 1990; Smith, 2007). In fact, Cameron and Blackburn (1981) found that current professors of English, psychology and sociology who reported that they had received mentor sponsorship while they were in graduate school (and their first academic position) also reported that as faculty members they were more engaged with a network of scholars, had higher publication rates, and received more grants, than their colleagues did.

In spite of the fact that men and women are equally mentored in terms of instrumental and psychosocial support (Eby et al., 2013), mentoring relationships are not leading to nearly as many advancements for women as for men. Ibarra et al. (2010) point out that men and women do not have the same kind of mentors; it is mostly men who describe being sponsored by their mentors (or have mentor-sponsors based on our definition). Specifically, men described how their mentors helped them plan for their progression, in addition to advocating for them publicly, while many women explained how mentoring relationships helped them recognize their strengths and weaknesses, and areas that they might need to develop as they progressed (Ibarra et al., 2010). As both mentoring and sponsorship can make the difference between succeeding and failing in doctoral programs (Hirt & Muffo, 1998), the fact that women have less access to mentor sponsorship in graduate school can limit their chances for both short-term and long-term success. URM doctoral students, like White women, have fewer opportunities to be sponsored. Additionally, once they are sponsored, their mentor-sponsors tend to inhabit lower level positions (with presumably a smaller range of influence and fewer resources in the field) compared to those in the majority (Turner, 2002).

***The importance of academic climate.*** The third context for socialization, academic climate, captures individual experiences and observations of interactions within the academy or the specific academic environment they are in, such as their institution or their department. For

the doctoral program specifically, academic climate is considered an environment that is “shaped by department-led and university-wide efforts to create the conditions for high expectations, high performance, and strong student support” (Council of Graduate Schools, 2010, p. 3).

As a dimensional construct, academic climate can be assessed both by its positive and negative features. For graduate departments/programs, positive academic climate is frequently conceptualized as a respectful and collaborative learning environment (e.g., de Valero, 2001). Though some researchers include adequacy of resources (e.g., library resources, grant-writing workshops) as positive features of department climate (e.g., Adams, 1993), more often the focus is on interpersonal and socioemotional factors such as friendliness, cooperation, feeling respected and valued, and a general sense of support and welcoming (e.g., Cross, 2001; de Valero, 2001; Schaefer & Schaefer, 1993).

On the contrary, characteristics on the negative dimension of academic climate often include isolation, unsupportiveness, hostility, and lack of collaboration (e.g., August & Waltman, 2004; Solem, Lee, & Schlemper, 2009). Among all these negative aspects, the problem of social isolation is the one that has been found to cause many doctoral students to leave the program (de Valero, 2001; Lovitts, 2001). The experience of isolation and alienation may have harmful effects, especially for those with marginalized social identities. For instance, Nelson and colleagues (2006), in interviews with former graduate students from lower socioeconomic background, found that participants characterized their experience of isolation and alienation as “being ostracized, feeling misunderstood by family, feeling like they didn’t fit in during graduate school, experiencing racism or sexism, being marginalized in graduate school, losing contact with peers, [and] feeling like misfits” (p. 5).

Academic climate can have a broad range of influences on students. Ostrove, Stewart,

and Curtin (2011) found that positive department climate, as captured by a strong sense of belonging to one's department, positively affected doctoral students' academic confidence in graduate school, which predicted greater aspirations to pursue academic careers.

Perceptions of academic climate have also been shown to have a positive association with students' academic success. Thompson, Orr, Thompson, & Grover (2007) examined the perceptions of campus climate among college students and found that student academic success was connected to their sense of campus belonging. The perceived dynamics among peers and faculty have been revealed to be associated with students' sense of belonging (to their academic community) and academic success including persistence and GPA (Booker, 2007; Gloria & Ho, 2003; Wyatt, Saunders, & Zelmer, 2005).

Prior studies uncovered that climate could have an impact on job satisfaction and productivity (Carr, Schmidt, Ford, & DeShon, 2003; Donovan, Drasgow, & Munson, 1998; Patterson, Warr, & West, 2004). Several studies have shown that job satisfaction was predicted by several aspects of positive climate, including supportiveness, teamwork, encouragement, and positive interpersonal interactions (Carr et al., 2003; Donovan et al., 1998; Gunter & Furnham, 1996; Johnson & McIntye, 1998). In a study assessing the consequences of academic climate for female academic scientists, Settles et al. (2006) demonstrated that perceptions of the department climate have a direct effect on women academic scientists' job outcomes; specifically, participants who viewed their department climate as more negative and discriminatory were less satisfied with their jobs, whereas those who reported a more positive climate described themselves as more productive.

Moreover, climate has been linked to job commitment and retention in the long run (e.g., Gonzales, 2001). For example, a study of military personnel found that less satisfaction with

interpersonal relationships in the workplace decreased job commitment and productivity among women (Offermann & Malamut, 2002). Among medical employees, Welsch and LaVan (1981) discovered that perceiving the work climate as collaborative predicted greater commitment and less turnover. In the university setting, the extent to which female academics perceived their work climate as discriminatory and sexist was related to their tendency to withdraw from the work (Schneider, Swan, & Fitzgerald, 1997).

Social identity and discipline affiliation matter in individuals' perceptions of academic climate. Research has shown that women, racial minority, and international faculty and students tend to have more negative views of the academic climate. Solem et al. (2009) in an interview study with graduate students showed that women and racial minority students, as well as international students, reported the greatest amount of social isolation in their programs. In another interview study with junior faculty members, Solem and Foote (2004) noted difficulties such as obtaining respect from undergraduate students, lecturing in English as non-native speakers, and having their research dismissed as unworthy by some senior faculty. All of these difficulties encountered in the department contributed to participants' perceptions of their departments as being unfriendly and unsupportive (Solem et al., 2009).

In addition to the experience of social isolation, women (especially those in male-dominated fields such as science and engineering) are more likely to experience mistreatment on the basis of their gender, such as gender discrimination (e.g., receive lower payment than men), sexual harassment, and sexual stereotyping (Barbercheck, 2001; Cortina, Swan, Fitzgerald, & Waldo, 1998; Fitzgerald, Drasgow, Hulin, Gelfand, & Magley, 1997; Mansfield et al., 1991).

Furthermore, regardless of field of study, women and URM students in general have reported that their departments favor White male students in a number of ways, including male-

oriented curriculum, male-dominated classroom discussion, and restricted academic and research opportunities (Kramarae & Treichler, 1990). In one study, women and URM students indicated that they learned better with interactive instructional styles, but their White male professors preferred a lecture style; therefore, women and URM students had to adjust their learning styles (Ferguson, 1992). Zhai (2004) also found that for international doctoral students, making the adjustment to the U.S. academic climate was the most significant challenge in their overall adjustment to the life in the United States.

### ***Marginalized Social Identities in the U.S. Academy***

In the extant education literature, challenges faced by individuals from traditionally marginalized (or subordinated) social groups in the academy have been identified. While enjoying a general reputation of being open, progressive and democratic, the U.S. academy often fails to acknowledge an inability to recognize the injustice (e.g., Jones, 2004) and subtle acts of oppression that are visited upon people with marginalized social identities within the ivory tower (e.g., Solorazano, 1998; Turner, 2002).

Marginalization occurs when certain groups of people are identified by members of the dominant culture as different from mainstream expectations (Wirth, 1945). This designation of difference can result in unequal treatment including discrimination, exclusion, invisibility, and silenced voices for the marginalized groups (Diggs, Garrison-Wade, Estrada, & Galindo, 2009). Previous research provides documentation about the ways in which the issue of marginalization can be manifested as unintended barriers to navigating the academic socialization process successfully.

There are many barriers to women at various stages on the academic path (e.g., Moyer, Salovey, & Case-Cannon, 1999). Regarding the experience of doctoral students, women are

more likely to leave the field before completing their degree, and are more likely to experience difficulties resulting from personal issues during graduate school than men (Lovitts, 2001; Solem et al., 2009). As mentioned earlier, despite equivalence in prior academic aptitude and performance, female doctoral students have lower academic confidence than male students in their programs (Ülkü-Steiner et al., 2000). Women also experience sexist discrimination (Barata, Hunjan, & Leggat, 2005) and sexual harassment in graduate school (Cortina et al., 1998). Moreover, female graduate students and PhDs express more family-related concerns and hold stronger perceptions of the inability to keep a work-life balance in academia than their male colleagues (Mason & Goulden, 2002; Morrison, Rudd, & Nerad, 2011).

At the faculty level, relative to men, women tend to be hired less frequently (Moore & Sagaria, 1993) and to be hired disproportionately into lower ranked positions (Harper, Baldwin, Gansneder, & Chronister, 2001). Female faculty are awarded tenure and promotion more slowly and less often (Bain & Cummings, 2000; Moore & Sagaria, 1993), and paid less than their male colleagues, even when controlling for other variables such as age, rank, discipline, and institutional type (Nettles, Perna, & Bradburn, 2000). In male-dominated STEM fields, problems listed above are intensified. In 2013, though 41% of women received PhDs in science and engineering, women represented only 11% of tenured faculty in engineering and 28% of tenured faculty in science at universities and four-year colleges in the U.S. (National Science Foundation, 2015). Studies have also shown that women in science and technology receive lower salaries, lower status, social isolation from peers, plus poorer prospects for promotion and fewer opportunities for leadership than men (Brush, 1991; Campbell & Skoog, 2004; Settles, Cortina, Stewart, & Malley, 2007).

Racial minorities also experience a range of inequities in the academy as a result of their

racial identities. Concerning academic-related outcomes, URM students (and White women in male-dominated fields) may undergo negative consequences associated with stereotype threat, which occurs when people feel themselves to be at risk of confirming negative stereotypes about their social groups (Steele & Aronson, 1995). In academic settings, suffering from stereotype threat may result in lower performance (Steele, 1997; Spencer, Steele, & Quinn, 1999) and reduced sense of belonging to the academic field (Steele, James, & Barnett, 2002). Further, results from past research consistently reveal that URM doctoral students report more racial discrimination than do their White peers (Barnes & Wells, 2009; Gay, 2004; Nettles, 1990). Both URM faculty and students are also more likely than White people to perceive the academic climate as negative, non-welcoming, exclusive, and racist (Gay, 2004; Kramarae & Treichler, 1990).

In addition to those relatively covert forms of racial discrimination, URM individuals are also vulnerable to *microaggressions*, which are defined as “subtle, stunning, often automatic, and nonverbal exchanges” used by perpetrators as “put-downs” for the racial minorities (Pierce, Carew, Pierce-Gonzales, & Willis, 1978, p. 66). Though the term was initially created to capture the experience of people of color, in recent years, research on microaggression has broadened the term to include insults based on not only the target’s race but also gender, ethnicity, ability status, sexual orientation, social class, or other identities that the perpetrators ascribe to the targeted individuals. Microaggressions in academia often connect to acts that have the effect of delegitimizing scholars of marginalized social groups. Sue et al. (2007) defines microaggressions towards academics as “everyday verbal, nonverbal, and environmental slights, snubs, or insults, whether intentional or unintentional” which delegitimize people “based solely upon their marginalized group membership” (p. 271). Women of color are a major target of

microaggressions in higher education institutions. As revealed by Muhs, Niemann, Gonzalez, and Harris (2012), URM female faculty are frequently grappling with experiences of microaggression and daunting challenges throughout the process of hiring, promotion, and tenure, including struggles with students, colleagues, and administrators who do not understand or appreciate their challenges. The stress associated with having to confront the ongoing microaggression can cause significant and chronic health issues coupled with barriers to recognition and advancement as academics (Lukes & Bangs, 2014).

International students are another marginalized group within the U.S. academy, yet their experience differs from women and URM students in many respects. Unlike White women and URM doctoral students, who tend to have lower academic confidence and a lower sense of belonging to their field of study, international doctoral students are found to be confident and have a higher sense of belonging in academia than their domestic counterparts (Curtin, et al., 2013; Le & Gardner, 2010). However, studies also show that international students suffer from forms of marginalization that are uniquely associated with their international identity, and for some, their identity as non-native English speakers as well. Yoon (2013) uncovered that despite their high English proficiency, non-native English-speaking international graduate students experienced feelings of isolation in academic settings when they encountered unfamiliar interaction patterns or culturally embedded references (e.g., jokes, anecdotes) of domestic English-speaking students. Further, both domestic and international students in Yoon's (2013) study acknowledged the fact that power is unevenly distributed among graduate students depending on the nativeness of English and familiarity with the U.S. culture; international students thus tended to perceive themselves as having inferior status in their academic community compared to their domestic peers.

Aside from the experience of alienation that is related to language barriers and cultural unfamiliarity (e.g., Trice, 2004, 2007; Yoon, 2013), international doctoral students also encounter challenges that are associated with the U.S. education system and academic structures (Andrade, 2008; Okorochoa, 1996). Many international doctoral students come from higher education systems that are different from those in the United States, and may have embraced learning styles that are seen as typical in their own culture but atypical from a U.S. perspective (Ku, Lahman, Yeh, & Cheng, 2008). As mentioned earlier, Zhai (2004) noted that international doctoral students considered adjusting and adapting to the American academic climate was the most significant challenge in transitioning to life in the United States. Lin and Yi (1997) also found that Asian international students with graduate teaching assistantship responsibilities felt alienated from their students and cohorts because they did not understand the expectations and norms associated with an American undergraduate classroom.

Despite the challenging experience for those who belong to certain marginalized social groups, for individuals with multiple subordinated social identities (i.e., students from social groups that traditionally have been underrepresented in higher education), the process of academic socialization is likely to pose more difficulties. Based on *social identity theory* (e.g., Taifel, 1974; Taifel, Billig, Bundy, & Flament, 1971; Tajfel & Turner, 1986) and the theory of *intersectionality* (e.g., Cole, 2009; Crenshaw, 1991), one negative outcome that people with multiple minority identities in academia may experience is referred to as “double/triple/multiple jeopardy” (Beale, 1979; Bowleg, Huang, Brooks, Black, & Burkholder, 2003; King, 1988). This idea indicates that people with more than one marginalized or subordinate social identity can experience oppression associated with their multiple subordinated identities, making the focus of the negative experience harder to identify or combat.

According to social identity theory (SIT), individuals seek to maintain or promote in-group self-esteem by developing a positive self- and group-concept. Moreover, in order to generate a positive in-group identity, group members must perceive the in-group as distinctive and unique in comparison to the out-group (Tajfel & Turner, 1986). A majority of the studies centered on SIT in the past, especially those performed by social psychologists, focus on the ways in which identities (either as separated or combined) play themselves out in intergroup dynamics and ingroup favoritism (see Hogg, Terry & White, 1995 for a review). When unpacking the experience of people with multiple devalued identities, SIT contributed to the understanding of the additive model of “double/triple/multiple jeopardy,” arguing that an individual with two or more minority identities is confronted by prejudice and discrimination associated with his or her marginalized identities summed together (Purdie-Vaughns & Eibach, 2008). The more subordinated identities an individual has, the more cumulative discrimination he or she is likely to encounter (Epstein, 1973; King, 1988).

Alternatively, other researchers propose an intersectional approach to conceptualizing the situation of holding multiple subordinate identities. According to this approach, people who embody multiple marginalized social identities suffer from more negative treatment, because all of these identities are interconnected, meaningful only in relation to one another, and useful in predicting outcomes when considered jointly (Cole, 2009; Crenshaw, 1991; Deaux & Stewart, 2001; Smith & Stewart, 1983). Intersectionality holds that there is no singular experience of an identity, and is concerned with the ways in which people “experience, organize, and negotiate their membership in the full range of social categories to which they belong” (Cole & Omari, 2003, p. 786). The intersectional perspective emphasizes the importance of taking multiple, overlapping social identities into account in order fully to understand the particular constraints

and privileges created by one's corresponding social locations/identities.

Another negative consequence associated with individuals with multiple marginalized social identities in the academy is explicated by the notion of intersectional invisibility (Purdie-Vaughns & Eibach, 2008). Intersectionality invisibility suggests that people who have multiple subordinated identities (e.g., black women, Latino gay men) tend to be defined as non-prototypical members of each of the groups to which they belong to. Because they do not fit the prototype of each of their respective identity groups, they may experience themselves as invisible in discussions of any one of them.

In the academic realm, certain minority groups tend to be more vulnerable to intersectional invisibility and suffer more from it as a consequence compared to other groups. For instance, Montero-Sieburth (1996) claims that Latina faculty must overcome more obstacles to gain support for academic advancement, because they are farther removed from the academic old-boy network (Epstein, 1971) than their Latino or White female counterparts. In a similar vein, hooks (1991) points out that scholars writing about Black intellectual life focus solely on the lives and works of Black men, ignoring and devaluing the scholarship of Black women. As a consequence of intersectional invisibility, individuals with intersectional marginalized social group memberships in the field face a continuous struggle to “have their voices heard and, when heard, understood,” and are thus underrepresented as leaders of their ingroup and less influential over others compared to those with more prototypically subordinated identities (Purdie-Vaughns & Eibach, 2008, p. 383).

### ***Current Study***

The general purpose of this dissertation is to examine how institutional factors (i.e., institutional support, mentor sponsorship, department climate) and personal factors (i.e.,

importance of graduate experiences, group-based experience) relate to one another, and are together associated with doctoral students' academic confidence. I tackle this overarching goal by testing a general hypothesized model (see Figure 1) while controlling for four demographic variables (gender, URM status, international status, and field of study). The testing of the general model is followed by multigroup analyses to assess whether the model works similarly or differently for a given social group (based on a given single or intersectional social group membership). Thus, my first set of hypotheses is:

H1: The proposed model will account best for doctoral students' academic confidence in comparison with alternative models I will test.

H2: I also propose that the model may not fit every group of doctoral students equally well.

Specifically, I am interested in how doctoral students' single and intersectional social identities predict their level of experience in each of the six areas (i.e., the six key variables: academic confidence, department climate, group-based experience, importance of graduate experiences, institutional support, and mentor sponsorship) in graduate school.

Specific demographic hypotheses (based on the demographic variables) and relationship hypotheses (based on the general hypothesized model) are listed below.

*Demographic hypotheses.* Before looking into the relationships among key variables (see Figure 1), I make several predictions concerning the relationship between the demographic variables and those key variables.

First, according to the extant literature, doctoral students with lower status social identities typically have less access to institutional support (e.g., August & Waltman, 2004; Olsen et al., 1995; Sato & Hoge, 2009) and mentor sponsorship (e.g., Ibarra et al., 2010; Turner,

2002), perceive their academic climate more negatively (e.g., Gay, 2004; Solem et al., 2004, 2009; Zhai, 2004), and have a more negative experience in the academy due to their identities (e.g., Barata et al., 2005; Barnes & Wells, 2009; Yoon, 2013) than those with dominant identities, I thus expect that:

D-H1. Students with marginalized identities (female; URM; international) will have lower ratings of *institutional support* than those with majority identities (male; non-URM; non-international).

D-H2. Students with marginalized identities (female; URM; international) will have lower ratings of *mentor sponsorship* than those with majority identities (male; non-URM; non-international).

D-H3. Students with marginalized identities (female; URM; international) will have lower ratings of *department climate* than those with majority identities (male; non-URM; non-international).

D-H4. Students with marginalized identities (female; URM; international) will have higher ratings of (negative) *group-based experience* than those with majority identities (male; non-URM; non-international).

Further, it is important to consider the implication of double/triple/multiple jeopardy (Beale, 1979; Bowleg et al., 2003; King, 1988): namely, that individuals who embody more than one minority identity are vulnerable to more negative experiences in the system due to their intersectional minority status (e.g., Crenshaw, 1991; Purdie-Vaughns & Eibach, 2008; Stewart & Dottolo, 2005). In the current study, URM women and international women are two groups with intersectional minority identities; hence, I will test the following hypotheses to compare these two groups to their corresponding groups (of those with only one of the two minority identities):

D-H1<sub>A</sub>. Students with intersectional marginalized identities (URM females; international females) will have lower ratings of *institutional support* than those with only one marginalized identity (non-URM females, URM males; non-international females, international males).

D-H2<sub>A</sub>. Students with intersectional marginalized identities (URM females; international females) will have lower ratings of *mentor sponsorship* than those with only one marginalized identity (non-URM females, URM males; non-international females, international males).

D-H3<sub>A</sub>. Students with intersectional marginalized identities (URM females; international females) will have lower ratings of *department climate* than those with only one marginalized identity (non-URM females, URM males; non-international females, international males).

D-H4<sub>A</sub>. Students with intersectional marginalized identities (URM females; international females) will have higher ratings of (negative) *group-based experience* than those with only one marginalized identity (non-URM females, URM males; non-international females, international males).

Next, as reviewed previously, doctoral students belonging to marginalized social groups tend to have lower academic confidence than those in the majority (e.g., Ülku-Steiner et al., 2000; Felder et al., 1995; Jackson et al., 1993), with the exception of international students.

Specifically, using a sample from the current institution, Curtin et al. (2013) found that international doctoral students have stronger academic self-concept than domestic students.

Therefore, combining these sources of evidence, I predict that:

D-H5. Female and URM students will report lower *academic confidence* than male and

non-URM students.

To address URM women's intersectional minority status, I also predict that:

D-H5<sub>A</sub>. URM female students will report lower *academic confidence* than non-URM female and URM male students.

Additionally, I have outlined the significance of taking disciplinary contexts into account while unpacking doctoral students' experience in graduate school. I have also explained the intention of using the STEM versus non-STEM division as the broader grouping variable in the current study, as STEM disciplines are distinct from others both in terms of demographic composition and research and learning approaches (e.g., National Center for Education Statistics, 2001; U.S. Census Bureau, 2011; Gardner, 2007; Honey et al., 2014). Considering that STEM departments are mainly dominated by non-URM men (both in terms of faculty and graduate students) who are unlikely to be sensitive to the homogenous and exclusive (in terms of race and gender) climate of their department, I expect that:

D-H6. Students in STEM fields will have higher ratings of *department climate* than those in non-STEM fields.

Moreover, given the fact that female and URM doctoral students are more underrepresented in STEM disciplines than their female and URM peers in non-STEM disciplines<sup>1</sup>, and are likely to encounter more challenges as absolute minorities in those fields, the following hypotheses complement my former predictions (i.e., D-H1 to D-H5):

D-H7. Female and URM students in STEM fields will have lower ratings of *institutional support* than female and URM students in non-STEM fields.

D-H8. Female and URM students in STEM fields will have lower ratings of *mentor*

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<sup>1</sup> Note that international doctoral students are not underrepresented in science and engineering fields (e.g., Curtin, 2013) at the current institution and are thus not considered as minorities in those fields; however, the gender disparity still remains within the groups of international students.

*sponsorship* than female and URM students in non-STEM fields.

D-H9. Female and URM students in STEM fields will have lower ratings of *department climate* than female and URM students in non-STEM fields.

D-H10. Female and URM students in STEM fields will have higher ratings of (negative) *group-based experience* than female and URM students in non-STEM fields.

D-H11. Female and URM students in STEM fields will report lower *academic confidence* than female and URM students in non-STEM fields.

Taking an intersectional approach, URM women in STEM departments are potentially exposed to more difficulties and negative treatment compared to those with only one subordinated identity (i.e., non-URM women, URM men, international women) in STEM. Further, since both gender and racial disparities are larger in STEM than non-STEM fields, URM women in STEM are likely to have a more difficult experience in their fields than their peers in non-STEM fields. Combining these two assumptions, I predict that:

D-H7<sub>A</sub>. URM female students in STEM fields will have lower ratings of *institutional support* than those with only one marginalized identity (non-URM female, URM male, international female) in STEM fields.

D-H7<sub>B</sub>. URM female students in STEM fields will have lower ratings of *institutional support* than URM female students in non-STEM fields.

D-H8<sub>A</sub>. URM female students in STEM fields will have lower ratings of *mentor sponsorship* than those with only one marginalized identity (non-URM female, URM male, international female) in STEM fields.

D-H8<sub>B</sub>. URM female students in STEM fields will have lower ratings of *mentor sponsorship* than URM female students in non-STEM fields.

D-H9<sub>A</sub>. URM female students in STEM fields will have lower ratings of *department climate* than those with only one marginalized identity (non-URM female, URM male, international female) in STEM fields.

D-H9<sub>B</sub>. URM female students in STEM fields will have lower ratings of *department climate* than URM female students in non-STEM fields.

D-H10<sub>A</sub>. URM female students in STEM fields will have higher ratings of (negative) *group-based experience* than those with only one marginalized identity (non-URM female, URM male, international female) in STEM fields

D-H10<sub>B</sub>. URM female students in STEM fields will have higher ratings of (negative) *group-based experience* than URM female students in non-STEM fields.

D-H11<sub>A</sub>. URM female students in STEM fields will report lower *academic confidence* than those with only one marginalized identity (non-URM female, URM male, international female) in STEM fields.

D-H11<sub>B</sub>. URM female students in STEM fields will report lower *academic confidence* than URM female students in non-STEM fields.

Last, based on the previous finding that international doctoral students perceived graduate experiences as more important to them than domestic students (Curtin et al., 2013), I have one specific hypothesis as follows. With limited literature available regarding this variable, I do not have any other predictions concerning group or field differences.

D-H12. International students will rate the importance of graduate experiences higher than non-international students.

*Relationship hypotheses.* The associations among variables hypothesized to predict academic confidence are shown in Figure 1. Please note that each of these predicted associations

assumes controlling for all other variables in the model, as well as for the four demographic variables.

As reviewed above, I hypothesize that particular forms of institutional socialization will relate to students' development of academic confidence. Specifically:

Past research indicates that *institutional support* helps doctoral students establish themselves as academics (e.g., Wulff & Austin, 2004) during their process of socialization in graduate school. While graduate experiences are presumably important to all doctoral students as they make great efforts to participate and succeed in their academic program, Curtin et al. (2013) in their study found that international students rated the *graduate experiences* as significantly more important than domestic students. As the finding implies that it is possible that the extent to which institutional support may influence doctoral students' academic confidence depends on the value students associate their graduate experiences with, I anticipate that:

R-H1. Institutional support will be positively associated with academic confidence (i.e., higher ratings of institutional support will predict higher academic confidence).

R-H2. Importance of graduate experiences will moderate the positive association between institutional support and academic confidence (i.e., higher ratings of institutional support will predict higher academic confidence more under conditions of high ratings of importance of graduate experiences compared to lower ratings of importance of graduate experiences).

As reviewed earlier, *mentor sponsorship* and *academic climate* have been shown to contribute to academic confidence (that is, a positive climate and mentor sponsorship will predict higher academic confidence). Therefore, I expect that:

R-H3. Mentor sponsorship will be positively associated with academic confidence (i.e.,

more positive views of department climate will predict higher academic confidence).

R-H4. Department climate will be positively associated with academic confidence (i.e., more positive views of department climate will predict higher academic confidence).

Because negative treatment (e.g., stereotype threat, microaggression) experienced on the basis of one's social group membership will affect students' academic outcomes (e.g., Lukes & Bangs, 2014; Steele, 1997), I predict that:

R-H5. Group-based (negative) experience will be negatively associated with academic confidence (i.e., lower ratings of group-based negative experience will predict higher academic confidence).

Given the finding (e.g., August & Waltman, 2004; Solem et al., 2009) that an academic climate that tends to be alienating, isolating, and unsupportive may perpetuate forms of mistreatment (on the basis of one's social group membership) for many individuals (especially for those who belong to subordinated social groups), I propose that:

R-H6. Department climate will be negatively associated with group-based (negative) experience (i.e., more negative perceptions of department climate will predict higher ratings of group-based negative experience).

As discussed previously, mentor-sponsors in the doctoral programs make the doctoral student mentees feel more connected to the field, advocate for their advancement, and bring them more opportunities for collaboration (e.g., Eby et al., 2013; Ibarra et al., 2010), which may help the students develop a stronger sense of supportiveness and inclusiveness of their academic units. Based on this assumption, I expect that:

R-H7. Mentor sponsorship will be positively associated with department climate (i.e., higher amount of mentor sponsorship will predict more positive perceptions of department climate).

Finally, considering the fact that institutional support consists of various resources for doctoral students to help them mitigate feelings of isolation and exclusion in their departments (e.g., Gardner, 2010), and provides students with opportunities for professional development to connect to more mentor-sponsors in their field (e.g., Austin, 2002; Gaff et al., 2000), I propose the following two claims:

R-H8. Institutional support will be positively associated with department climate (i.e., higher ratings of institutional support will predict more positive perceptions of department climate).

R-H9. Institutional support will be positively associated with mentor sponsorship (i.e., higher ratings of institutional support will predict more mentor sponsorship).

## **Chapter 2: Method**

This dissertation tested the proposed model (see Figure 1) and specific hypotheses using data collected as part of the Graduate Student Climate Survey. The research site of the current study was a large Midwestern U.S. public research university with about 5,000 doctoral students (18% URM and 34% international in 2015 across all fields). The Graduate Student Climate Survey was collected by the ADVANCE Program affiliated with the university. The purpose of the broader ADVANCE Program is to understand and improve the environment for women and underrepresented minorities in the academy. This survey was designed to assess aspects of graduate life and departmental climate for graduate students, modeled in part on the ADVANCE climate survey administered to faculty members (Stewart, LaVaque-Manty & Malley, 2004; Stewart, Stubbs & Malley, 2002).

### ***Participants and Procedure***

Between 2009 and 2015, doctoral students across 42 departments were asked to participate in the Graduate Student Climate Survey in the context of a broader climate assessment of their department. Participants were recruited via email to complete an Internet survey to assess their experiences of climate and other aspects of their graduate education experience. A total of 2,255 PhD students have completed surveys; however, 1,189 were excluded from the present analyses because they did not indicate either their gender (or selected “transgender” see further explanations in measures), whether they belong to an underrepresented racial minority group (or not), or whether they are international people (or not); missing cases were handled using list-wise deletion. The final sample contained 1,066 doctoral students in 40

departments.

The large proportion of participants excluded from the original sample may be explained by two methodological details. First, except for gender (which was assessed using a single multiple choice question), no demographic questions were asked directly. Instead, participants' racial status (URM vs. non-URM) and international status (international vs. non-international) were measured based on their responses to a checklist which asked them to indicate whether they belonged to certain social groups which included "international people" and "underrepresented minorities" (see Appendix G for the actual checklist items on page 4 of the survey). People who did not belong to a particular social group left the corresponding box unchecked; however, those who had no checkmarks on the entire checklist were treated as having missing data because they should have selected at least one of the boxes if they understood or paid careful attention to the questions (note that there were boxes for "men" and "women" for them to select from). In fact, after removing 333 participants who had missing data on gender, I excluded an additional 853 (72% of the excluded sample) participants who had missing data on either URM status or international status or both. Thus, most of the missing data came from people not responding to either direct or indirect questions about demographic group statuses. Second, because the data collection process was department-based and some of the departments were very small, in the context of a climate review, it is possible that participants from underrepresented social groups in the department would be concerned about disclosing identifiable information at the time of the department climate survey and thus chose not to respond to certain demographic questions (including the question about gender). There is no information about non-respondents' reasons for not responding.

The 1,066 students with complete data were compared with the 1,189 missing some data.

There was no significant difference on the ratings of the outcome measure (i.e., academic confidence) for the study sample ( $M = 3.12$ ,  $SD = .61$ ) and the subgroup with incomplete data ( $M = 3.06$ ,  $SD = .64$ );  $t(1,965) = -1.89$ ,  $n$ . There were no significant differences on the ratings of other key variables for the study sample and the excluded sample as well, including institutional support ( $M_{\text{study}} = -.01$ ,  $SD_{\text{study}} = .87$ ;  $M_{\text{excluded}} = -.00$ ,  $SD_{\text{excluded}} = .95$ ;  $t(2, 161) = -2.97$ ,  $ns$ ), mentor sponsorship ( $M_{\text{study}} = -.02$ ,  $SD_{\text{study}} = .78$ ;  $M_{\text{excluded}} = -.06$ ,  $SD_{\text{excluded}} = .83$ ;  $t(1,566) = -3.01$ ,  $ns$ ), department climate ( $M_{\text{study}} = 3.77$ ,  $SD_{\text{study}} = .77$ ;  $M_{\text{excluded}} = 3.75$ ,  $SD_{\text{excluded}} = .73$ ;  $t(1,784) = -2.35$ ,  $ns$ ), and importance of graduate experiences ( $M_{\text{study}} = 3.09$ ,  $SD_{\text{study}} = .40$ ;  $M_{\text{excluded}} = 3.04$ ,  $SD_{\text{excluded}} = .44$ ;  $t(2, 198) = -2.04$ ,  $ns$ ). Therefore, there is reason to assume that findings from the students who provided complete data do generalize to all doctoral students at this institution from the sampled fields.

### ***Measures***

*Gender.* Students were asked to indicate their gender in the survey by selecting from “female,” “male,” and “transgender.” Since only 3 out of the 2,255 survey respondents had selected “transgender” at the time of the analysis, they were excluded for these analyses. Of the 1,066 students included in the current analyses, 46% ( $n = 490$ ) identified as female, and 54% ( $n = 576$ ) were male. Responses were coded as 0 = male and 1 = female.

*URM status.* Participants were given the opportunity to indicate underrepresented racial and/or ethnic minority group membership in the context of the assessment of climate. The instrument used to survey group memberships was a six-item checklist of social identities with the prompt “I belong to this group,” and the response option “underrepresented minorities” (among others such as “international people” and “sexual minorities”). No additional items concerning participants’ race/ethnicity were included in the survey.

According to the U.S. Census Bureau, underrepresented minorities (URM) refers to individuals who are blacks, Hispanics, and American Indians, and other race/ethnicity identifications that are neither White nor Asian/Asian American (NSF, 2013; U.S. Census Bureau, 2011). In the study sample, 14.1% identified themselves as “underrepresented minorities” ( $n = 150$ ), and the remaining sample (85.9%;  $n = 916$ ) were thus considered as “non-URM” students. Since no explicit definition of “underrepresented minorities” was given at the time of the survey, participants might have employed a definition of URM different from the one stated above when responding to this question, regardless of their actual selection of option. Numerical values were assigned to this variable, with and 0 = non-URM and 1 = URM.

*International status.* As noted in the measure of URM status, participants selected whether they belong to the group of “international people” (or not) among other identity measures. Twenty-two percent of the participants ( $n = 234$ ) indicated that they were international people, and 78% of them ( $n = 832$ ) did not identify themselves as international. No follow-up questions regarding country of citizenship were given at the time of the survey. The international status variable was coded as 0 = non-international, and 1 = international.

*Field of study.* During data collection, each student was given a code corresponding to their department. Responses were first coded into five divisional categories used at the institution: social science, humanities, natural science, engineering, and professional schools (Schools of Information, Education, and Nursing). Disciplines were then categorized as either STEM or non-STEM in the current study following accepted definitions of STEM as including the natural-physical sciences, technology, engineering, and mathematics (e.g., Chen & Weko, 2009). Instances of STEM departments (or programs) included engineering, mathematics, economics, natural sciences, physically sciences, environmental sciences computer and

information sciences pharmaceutical and biomedical sciences, epidemiology, and so forth. Examples of departments or programs categorized as non-STEM field included psychology, sociology, dance/theater, law, architecture, literature, language, arts, etc. Participants in STEM field ( $n = 525$ ) accounted for 49.2% of the sample of doctoral students; students in non-STEM field comprised the remaining 50.8% ( $n = 541$ ) of the sample. Numerical values were assigned to this STEM vs. non-STEM field variable, with 0 = non-STEM, and 1 = STEM.

*Institutional support.* Two scales were used as indicators of the institutional support variable (see Appendix A). First, an advice and information resources scale was created using twelve items that measured students' satisfaction towards various types of resources and help provided by their department/program. Sample items include "I am satisfied with the advice that I receive from sources at [the current institution] other than my research advisor (including thesis committee)," "The department does a good job at communicating expectations about degree and/or training requirements," "The department staff are helpful, courteous, and respectful," and "My department training is preparing me well for my future career" (see Appendix G for the full list of items on page 2 of the survey). Participants rated their level of satisfaction on a 5-point scale ranging from 1 = "strongly disagree" to 5 = "strongly agree." The sample mean was 3.73 ( $SD = .65$ ;  $\alpha = .87$ ).

Second, a sufficient opportunities scale was generated to investigate participants' perceptions of the opportunities provided for them as graduate students at the current institution. A total of 17 items were included in the scale which asked for participants ratings of opportunities in three subdomains that were research-related (5-item;  $\alpha = .61$ ), curriculum-related (5-item;  $\alpha = .57$ ), and professional development (7-item;  $\alpha = .66$ ). The list of items were selected based on the assessment of importance of graduate experiences (see further descriptions of the

importance of graduate experiences variable below). Participants offered their ratings to the list of items following the prompt “have you had sufficient opportunities for this experience at [the current institution]?” Responses were coded using a two-point scale; 1 = “no” and 2 = “yes”. The sample mean was 1.74 ( $SD = .21$ ;  $\alpha = .78$ ). For the analysis purpose, the two subscales were standardized and then combined to create an overall scale assessing institutional support ( $M = .01$ ,  $SD = .87$ ;  $\alpha = .62$ ).

*Mentor sponsorship.* I included two subscales to capture both the quantity and quality of the mentor sponsorship students received (see Appendix B). The amount of mentor sponsorship was assessed using four items concerning the number of mentors inside department who provided various kinds of sponsorship to the participant (“promote my career through encouraging contacts with other researchers”; “advises about career advancement”; “advises about departmental/national awards and fellowships”; “advocates for me”). It is important to note that no definition of “mentor” was included in the survey, which means that participants could define the criteria for mentors based on their own experience and their mentors did not have to be their advisors and other faculty members in the department (i.e., they could be other graduate students, post-docs, etc.). Participants reported the number of mentors they had in each of these four areas in an open-ended format. I then coded their individual numerical responses based on a 5-point scale (1 = no mentor, 2 = 1 mentor, 3 = 2 mentors, 4 = 3-4 mentors, and 5 = 5 or more mentors) so that high scores indicated high quantity of mentors ( $M = 2.57$ ,  $SD = .87$ ;  $\alpha = .84$ )<sup>2</sup>.

One additional item was treated as a separate measure of the quality of the mentor sponsorship. Specifically, participants were asked to report the adequacy of the advice they were receiving from their primary advisor on a 4-point scale (from 1 = “not at all adequate” to 4 =

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<sup>2</sup> For this particular measure, data from 2 out of the 40 departments (Public Health,  $n = 9$ ; Near Eastern Studies,  $n = 9$ ) were not applicable for this analysis as the two departments modified the items on the scale when distributing the survey to their students.

“very adequate”) with a sample mean of 3.24 ( $SD = .87$ ). This one item and the quantity measure described above (i.e., the number of mentors) were standardized and then aggregated to generate an overall scale measuring mentor sponsorship ( $M = -.02$ ,  $SD = .78$ ;  $\alpha = .82$ ).

*Department climate.* The survey of department climate included 16 descriptive items assessing various aspects of the departmental environment (items came in pairs), all on a 5-point scale ranging from 1 = negative (e.g., alienating, hostile, threatening) to 5 = positive (e.g., welcoming, friendly, protective). These items were selected on the basis of the measurement of semantic differentials used in a previous university campus climate survey at another large research university (Hurtado, 1998) and suggestions from graduate student focus groups conducted at the current institution in 2004 (Churchwell, 2006). See Appendix G for the full list of items on page 4 of the survey. Three items were taken out of the current measure (sexist/non-sexist, racist/non-racist, and homophobia/non-homophobia) to avoid overlapping meanings with the measure of group-based experience, resulting in a 13-item department climate scale (see Appendix C). Each participant received an individual score based on the average of their responses to the 13 items. The mean score for the sample was 3.77 ( $SD = .77$ ;  $\alpha = .93$ ), indicating that students in general rated the climate to be moderately positive.

*Group-based experience.* In order to understand doctoral students’ personal experiences in their academic environment on the basis of their self-selected social identities, I used six items (see Appendix D) to assess whether participants had experienced certain negative interactions due to the social group they belong to in their department (e.g., “Some faculty members have a condescending attitude toward [my group]”; “There is not a supportive student community for [my group]”). Please see Appendix G for the list of items included in the current scale. Responses were coded using a two-point scale; 0 = “absent” and 1 = “present” so that high

scores indicated more negative experiences ( $\alpha = .63 - .68$ ). The score was computed based on the percentage of participants' reported experiences out of all group-based negative interactions (6 items multiplied by the number of group memberships). In this case, each participant was identified as having two group memberships, based on their gender and URM status or their gender and international status. For example, a non-URM male participant would receive two scores, one based on his gender group status (i.e., "men") and the other one based on his URM group status (in fact, as a non-URM person, the participant would receive a score of "0" in this category as the absence of the experience of "underrepresented minorities" was coded as "0"). Taking international women as another example, an international female participant would receive one score based on her gender group status (i.e., "women") and another score based on her international group status (i.e., "international people"). Thus, participants were categorized into six mutually exclusive social groups and each received an individual score corresponding to their own social group memberships: non-URM men ( $M = .11, SD = .15$ ), non-URM women ( $M = .19, SD = .24$ ), URM men ( $M = .59, SD = .45$ ), URM women ( $M = .73, SD = .49$ ), international men ( $M = .40, SD = .37$ ), and international women ( $M = .54, SD = .46$ ); the sample mean was .28 ( $SD = .37$ ).

*Academic confidence.* The outcome measure for the current study concerned doctoral students' confidence in academic-related aspects of their graduate school experiences (see Ostrove et al. 2001 for the "sense of confidence" scale under the measure of "academic self-concept"). The current scale (see Appendix E) was created using six items that assessed participants' academic confidence ("I feel confident that I am in the right field"; "I feel confident that my research interests are considered important in my field"; "I feel confident that I can be successful in my field"; "I feel confident that I have received adequate training to be a good

researcher”; “I feel confident that I have received adequate training to be a good teacher”; “I feel confident in my abilities as a teacher”). Respondents indicated their level of confidence on a 4-point scale ranging from 1= “not at all true” to 4 = “very true.” The majority of participants were relatively confident about their academic experiences; the sample mean was 3.12 ( $SD = .61$ ;  $\alpha = .80$ ).

*Importance of graduate experiences.* Respondents were asked to rate the personal importance of a series of graduate school experiences on a 4-point scale from 1 = “waste of time” to 4 = “extremely important” (note that those who selected “not applicable” were excluded from the current analyses). The mean score of the overall scale was 3.09 ( $SD = .40$ ;  $\alpha = .81$ ). Combining the results of factor analysis and conceptual reasoning, three separate scales were developed with a total of 17 items to assess the importance of graduate experiences in three domains<sup>3</sup>: research-related, curriculum-related, and professional development (see Appendix F).

*Research-related experiences.* Five items assessed participants’ ratings of research-related experiences including: learning research techniques, conducting research, attending professional conferences, opportunities to present your research, and opportunities to participate in group or collaborative research. Each participant received one score based on the average of their responses to the 5 items. The mean score for the sample was 3.55 ( $SD = .41$ ;  $\alpha = .61$ ).

*Curriculum-related experiences.* Five items examined participants’ ratings of curriculum-related (i.e., degree-required courses, additional training) graduate experiences: teaching or serving as a GSI (graduate student instructor), cognate courses, elective courses, courses or training in pedagogy, and interdisciplinarity training. A score for each participant was generated using the mean of all 5 items. The mean score for the sample was 3.04 ( $SD = .59$ ;  $\alpha = .66$ ).

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<sup>3</sup> In the following texts throughout the entire dissertation, the “importance of graduate experiences” (variable) consistently refers to the overall scale containing 17 items.

Professional development experiences. Seven items assessed participants' ratings of experiences related to professional development: departmental lectures, talks, brown bags, or seminars; meeting outside speakers; practice interviews and/or job market help; receptions, parties, and other social events; non-department lectures, talks, brown bags, or seminars; study groups; and support groups/support organizations. The mean score for the sample on this scale was 2.79 ( $SD = .55$ ;  $\alpha = .77$ ).

### ***Analyses***

*Preliminary analyses.* Chi-square analyses were first performed to examine relationships among all pairs of demographic variables (i.e., gender, URM status, international status, and field of study). Aside from that, descriptive statistics and bivariate correlations for all variables were computed and are presented in Table 1.

*Analyses of variance (ANOVAs).* Analyses of variance were conducted to test the demographic hypotheses. Basically, I compared the means on each key variable between the pairs or among the sets of demographic groups.

*Structural equation modeling (SEM).* Structural equation modeling was adopted to estimate the extent to which paths among the variables in the hypothesized model (Figure 1) were reflected in the data, as well as the overall fit of the model. Path analysis models were estimated using the missing data facility in SPSS Amos 22. Amos handles missing data using full information maximum likelihood (FIML) estimation and results in unbiased parameter estimates and appropriate standard errors when data are missing at random. The four demographic variables were used as control variables in the proposed SEM analysis plan.

Two indices were used to assess fit for all models in the current analyses: the comparative fit index (CFI; Bentler, 1990) and the root mean square error of approximation

(RMSEA; Browne & Cudeck, 1993). CFI values greater than 0.90 are needed in order to ensure that misspecified models are not accepted (Bentler, 1990; Hoyle & Panter, 1995) and CFI values of 0.95 or higher are presently recognized as indicating good model fit (Hu & Bentler, 1999). RMSEA values of less than .05 are usually considered to indicate good model fit, and PCLOSE values should be greater than .05 (Browne & Cudeck, 1993). Moreover, because the chi-square statistic is sensitive to sample size, it nearly always indicates rejection of the model with large samples (Bentler & Bonnet, 1980). Thus, the relative/normed chi-square statistic (the ratio of chi-square/degree of freedom) is also reported; this statistic is often used to adjust for large sample size (Munro, 2005). Though there is no consensus regarding an acceptable ratio for the relative chi-square statistic, recommendations range from as high as 5.0 (Wheaton, Muthen, Alwin, & Summers, 1977) to as low as 1.0 (Byrne, 2001); generally a ratio between 1.0 and 3.0 is taken as an indicator of good fit (Kline, 2011; Munro, 2005).

A saturated model was run first. The saturated model was a model that included all additional possible pathways from one variable to the other in addition to those in the hypothesized model (see Figure 1). Assuming that all hypothesized pathways or part of them would be retained in the finalized model, I thus compared the model fit of the saturated model (of the hypothesized model) with all alternative models associated with it. Alternative models were those that retained paths from the hypothesized model and removed all non-significant paths from the saturated model one at a time. This step helped me to decide which additional pathways to include in the finalized general model.

The second step of the SEM testing was the multigroup analysis to examine whether the finalized general model worked similarly or differently for certain social groups. This step enabled me to explore and understand group differences that came out of my proposed model

(after being verified or varied). For example, when taking gender as the group comparison variable, I ran the model (with the other three demographic variables kept as controls in the model) separately for men and women and compared indices of the model fit to see if one group had better model fit over the other (and/or the general model). Though the minimum sample size required for the SEM usually depends on model complexity and many other factors (e.g., normality of the data, missing patterns), many researchers recommend using sample sizes of at least 200 or a “rule of thumb” formula which suggests adding 50 to the number of variables multiplied by 8 (Cohen, 1988; Kline, 2011; Westland, 2010). In the current study, if using 10 as the number of variables (this would include the interaction term in the moderation model and the three demographic variables for a group analysis), I would have an acceptable minimum sample size ranging from 130 to 200. When comparing this sample size range to the demographic composition in the current sample, I could confidently run the multigroup analysis on gender, international status, and field of study as all their subgroups have a sample size that is larger than 200. I could still run the multigroup analysis on URM status, but I had to keep in mind that the model fit for the URM group might lack statistical power (or certain controls might have to be dropped), given its small sample size ( $n = 150$ ).

## Chapter 3: Results

### *Preliminary Analyses*

Analyses were first performed to examine relationships among all pairs of demographic variables (i.e., gender, URM status, international status, and field of study).

Chi-square analyses indicated that there was a gender difference by URM status and field. First, URM students were more likely to be female than male, whereas non-URM students were more likely to be male than female,  $\chi^2(1) = 24.58, p < .001$ ; 64.7% of URM students were female, 57.1% of non-URM students were male. Second, there was a difference in field of study by gender. Male students were more likely to be enrolled in STEM fields than in non-STEM fields, whereas female students were more likely to be enrolled non-STEM fields than in STEM fields,  $\chi^2(1) = 64.48, p < .001$ ; 60.6% of male students were in STEM fields, and 35.9% of female students were.

There was also a difference in field by URM status. Non-URM students were more likely to be enrolled in STEM fields than in non-STEM fields, whereas URM students were more likely to be enrolled in non-STEM fields than in STEM fields,  $\chi^2(1) = 12.26, p < .001$ ; 51.4% of non-URM students were in STEM fields compared to 64.0% of URM students were in non-STEM fields.

In addition, there was a difference in field of study by international status: non-international students were more likely to be enrolled in non-STEM fields than in STEM fields, whereas international students were more likely to be enrolled in STEM fields than in non-STEM fields,  $\chi^2(1) = 4.15, p < .005$ ; 52.4% of non-international students were in non-STEM

fields, compared to 55.1% of international students were in STEM fields.

Finally, there was no relationship between gender and international status,  $\chi^2(1) = .46, p = .50$ .

### ***Analyses of variance (ANOVAs)***

Analyses of variance were conducted to test the demographic hypotheses.

*Comparing groups differing on one identity on graduate experience variables.* The first set of hypotheses (D-H1 to D-H4) was generated based on the assumption that doctoral students with subordinated identities would have a more negative experience with fewer accesses to resources compared to those with dominant identities. Specifically, I anticipated that female, URM and international students would have lower ratings of *institutional support* (D-H1), *mentor sponsorship* (D-H2), and *department climate* (D-H3), and higher ratings of *negative group-based experience* (D-H4) than their counterpart (i.e., male, non-URM, and non-international students).

Results suggested that D-H1 was fully supported such that significantly lower ratings of institutional support were found (see Table 2) among female compared to male, among URM students compared to non-URM students, and among international students relative to non-international students. Statistically significant group differences were also found in terms of perceptions of group-based experience with female, URM, and international students reporting more negative group-based experience than their male, non-URM, and non-international counterpart (see Table 2). Thus, D-H4 was fully supported.

Unlike the hypotheses with respect to institutional support (D-H1), and group-based experiences (D-H4), which were supported, the hypotheses regarding mentor sponsorship (D-H2), and department climate (D-H3) were only partially supported (see Table 2). Concretely,

URM students rated mentor sponsorship significantly lower than non-URM students; for the comparisons made by gender and international status, the group difference was not quite significant between female and male, and between international and non-international, students. With regard to department climate, statistically significant group differences were found when making gender and URM status comparisons; lower ratings of department climate were found among women than men, and among URM versus non-URM students. There was no significant difference in ratings of department climate between international and non-international students.

*Intersectional comparisons by gender, URM status, and international status.* In line with the general group hypotheses presented above (D-H1 to D-H4), I also had a set of predictions that incorporated the implications of intersectional identity theory. Namely, I expected that students with intersectional marginalized identities (URM female; international female) in the academy would encounter more negative experiences with less support compared to those with only one marginalized identity in their corresponding groups (non-URM female, URM male; non-international female, international male). In particular, I hypothesized that URM female and international female would have lower ratings of *institutional support* (D-H1<sub>A</sub>), *mentor sponsorship* (D-H2<sub>A</sub>) and *department climate* (D-H3<sub>A</sub>), and higher ratings of *negative group-based experience* (D-H4<sub>A</sub>) than their corresponding counterparts (non-URM female and URM male; non-international female and international male).

Comparisons of gender by URM identity (i.e., comparing URM female to non-URM female and URM male) suggested that hypotheses concerning institutional support (D-H1<sub>A</sub>), mentor sponsorship (D-H2<sub>A</sub>), department climate (D-H3<sub>A</sub>), and group-based experience (D-H4<sub>A</sub>) were fully supported (see Table 3). As predicted, URM female students offered significantly lower ratings of institutional support, mentor sponsorship and department climate in comparison

with non-URM female and URM male student. URM female students had significantly higher ratings of negative group-based experience (D-H4<sub>A</sub>) than non-URM female, and marginally higher ratings than URM male students.

Unlike the comparisons above, results from comparisons of gender by international identity (i.e., comparing international female to non-international female and international male) showed that only the hypothesis on group-based experience (D-H4<sub>A</sub>) was supported (see Table 3). As expected, international female students reported significantly higher ratings of negative group-based experience than non-international female and international male students. None of the group differences in institutional support (D-H1<sub>A</sub>), mentor sponsorship (D-H2<sub>A</sub>), and department climate (D-H3<sub>A</sub>) between international female and non-international female, and between international female and international male were significant, so these three hypotheses were not confirmed (see Table 3).

In sum, when making intersectional group comparisons, findings showed that the predicted differences in group-based experience (D-H4<sub>A</sub>) were fully supported for both gender by URM identity and gender by international identity comparisons. Anticipated differences in institutional support (D-H1<sub>A</sub>), mentor sponsorship (D-H2<sub>A</sub>), and department climate (D-H3<sub>A</sub>) were only fully supported by gender by URM identity comparisons.

*Comparing groups on academic confidence.* Based on the assumption that doctoral students belonging to marginalized social groups (except for international students) would have lower academic confidence than those in the privileged groups, I tested the general hypothesis (D-H5) that female and URM students would report lower *academic confidence* than male and non-URM students, and the intersectional hypothesis (D-H5<sub>A</sub>) that URM female students would report lower *academic confidence* than non-URM female and URM male students.

Results showed that the general hypothesis (D-H5) was not supported; there was no statistically significant difference in self-reported academic confidence between female and male, and between URM and non-URM students (see Table 4). The intersectional hypothesis (D-H5<sub>A</sub>), however, was supported (see Table 5), that URM female students reported significantly lower academic confidence than both non-URM female and URM male students.

*Comparison of department climate by field of study.* Considering the fact that non-URM male students are disproportionately overrepresented in STEM departments, and therefore may perceive the department climate as more positive than those in less homogenous non-STEM departments, I expected to find that doctoral students in STEM fields would have higher ratings of *department climate* than those in non-STEM fields (D-H6). The ANOVA result (see Table 6) confirmed my prediction that STEM students did provide significantly higher ratings of department climate than non-STEM students.

*Comparing graduate experience variables and academic confidence by field of study.* Taking field of study (i.e., STEM vs. non-STEM division) into account, my next set of hypotheses complemented part of my former predictions (D-H1 to D-H5) and aimed to test the possibility that female and URM students who belong to subordinated social groups and are underrepresented in STEM fields would have lower ratings of *institutional support* (D-H7), *mentor sponsorship* (D-H8), *department climate* (D-H9), and *academic confidence* (D-H11), and higher ratings of *negative group-based experience* (D-H10) than their group members in non-STEM fields.

Comparisons of female STEM and female non-STEM students showed that none of the hypotheses was supported (see Table 7). Specifically, the groups were not significantly different in institutional support (D-H7), mentor sponsorship (D-H8), group-based experience (D-H10),

and academic confidence (D-H11). There was a significant mean difference in ratings of department climate (D-H9) such that female STEM students provided higher scores of department climate than female non-STEM students; however, the group difference was not in the expected direction, indicating that D-H9 was not supported.

Results from comparisons of URM students in STEM and non-STEM departments showed a similar pattern of findings (see Table 7). First, there were no significant differences in institutional support (D-H7), mentor sponsorship (D-H8), and academic confidence (D-H11) between URM STEM and URM non-STEM students. Ratings of department climate (D-H9) and group-based experience (D-H10) from URM students in STEM did differ significantly from those in non-STEM fields, but none of them was in the predicted directions.

*Intersectional group comparisons of graduate experience variables and academic confidence by field of study.* Adopting the intersectional perspective (and to complement hypotheses D-H7 to D-H11 above), I expected to find that URM women in STEM would be exposed to more negative treatment and difficulties in comparison with those with only one minority identity (i.e., non-URM women, URM men, international women) in STEM fields. I also predicted that URM women in STEM would experience more difficulties in their fields than their URM female peers in non-STEM fields, given the larger gender and racial disparities in STEM than non-STEM fields. Combining these two assumptions, I hypothesized that URM female in STEM would have lower ratings of *institutional support* (D-H7<sub>A</sub>), *mentor sponsorship* (D-H8<sub>A</sub>), *department climate* (D-H9<sub>A</sub>), and *academic confidence* (H11<sub>A</sub>), and higher ratings of negative *group-based experience* (D-H10<sub>A</sub>) than non-URM female, URM male, and international female students in STEM fields. Further, I expected that former patterns would apply to the comparison between URM female in STEM and URM female students in non-STEM fields (D-

H7<sub>B</sub> to D-H11<sub>B</sub>).

Results from ANOVA analyses showed that only one of these hypotheses was partially supported (see Table 8). As predicted in D-H10<sub>A</sub>, URM female students in STEM had significantly higher ratings of negative group-based experience than non-URM female in STEM fields, but the other part of D-H10<sub>A</sub> was not confirmed, as there was no significant difference in group-based experience between URM females and URM males in STEM fields. The remaining group differences (see Table 8) were all non-significant (D-H7<sub>A</sub>, D-H7<sub>B</sub>, D-H8<sub>A</sub>, D-H8<sub>B</sub>, D-H9<sub>A</sub>, D-H11<sub>A</sub>, D-H11<sub>B</sub>) with two exceptions (D-H9<sub>B</sub> and D-H10<sub>B</sub>). Tests of D-H9<sub>B</sub> and D-H10<sub>B</sub> suggested significant group differences in ratings of department climate (D-H9<sub>B</sub>) and group-based experience (D-H10<sub>B</sub>) between URM female in STEM versus non-STEM fields; nevertheless, both were not in the anticipated direction, suggesting that D-H9<sub>B</sub> and D-H10<sub>B</sub> were not supported.

*Comparison of importance of graduate experience by international status.* Based on the literature suggesting that international PhD students valued graduate experiences more than domestic students, I hypothesized that international students would rate the *importance of graduate experiences* higher than non-international students (D-H12). The result indicated that D-H12 was fully supported (see Table 9) in that international students provided significantly higher ratings of the importance of graduate experience than non-international students.

### ***Saturated Model and Hypothesized Model***

The comparative fit index (CFI; Bentler, 1990) and the root mean square error of approximation (RMSEA; Browne & Cudeck, 1993) were used to assess fit for all models in the current analyses. CFI values greater than 0.90 are needed to ensure that misspecified models are not accepted (Bentler, 1990; Hoyle & Panter, 1995) and CFI values of 0.95 or higher are

recognized as indicating good model fit (Hu & Bentler, 1999). RMSEA is one of the most informative indices in SEM analysis and RMSEA values of less than .05 are considered to indicate good or close model fit (a RMSEA value between .08 and .10 demonstrates mediocre fit), and PCLOSE values should be greater than .05 to ensure good model fit (Browne & Cudeck, 1993; Byrne, 2001). The relative/normed chi-square statistic is often used to adjust for large sample size and is thus reported as well (Munro, 2005). Though there is no consensus regarding an acceptable ratio for the relative chi-square statistic (recommendations range from as high as 5.0 to as low as 1.0), a ratio between 1.0 and 3.0 is generally taken as an indicator of good fit (Kline, 2011; Munro, 2005).

A saturated model was run on the sample with complete data ( $n = 1,066$ ) to establish a baseline comparison for the hypothesized model. The saturated model included all possible pathways from each exogenous variable to each endogenous variable, as well as pathways among all exogenous variables ( $\chi^2(0) = 0$ ; CFI = 1.00; RMSEA = .30 [90% CI of .29 - .32], PCLOSE = .00). Because the saturated model did not fit well, the hypothesized model (Figure 1) was then tested. In addition, because the four demographic controls (gender, URM status, international status, and field of study) did not have significant effects on two exogenous variables (mentor sponsorship, academic confidence), the pathways from controls to these two variables were removed in the hypothesized model and all alternative models presented below.

The hypothesized model demonstrated exceptional fit (see Table 10). Despite the fact that two out of the eight hypothesized relationships (R-H5, the path between group-based negative experience and academic confidence; R-H2, the moderator effect of importance of graduate experiences) were not significant in the hypothesized model (half of the hypothesized pathways were not significant in the saturated model), the hypothesized model had significantly better fit

(per the RMSEA) compared to the saturated model and was therefore favored. Table 10 includes the standardized coefficients and significance levels for the hypothesized model.

As can be seen in Table 10, results suggested that mentor sponsorship and department climate were positive predictors of academic confidence (R-H3 and R-H4); students with more mentor sponsorship reported higher academic confidence, and students who had more positive perceptions of department climate reported higher academic confidence. In addition, the expectation that institutional support would positively predict academic confidence (R-H1) was confirmed. In accordance with the proposed model, department climate was found to be negatively associated with group-based (negative) experience (R-H6), such that those with more negative views of department climate gave higher ratings of group-based negative experience. Also as expected, both mentor sponsorship and institutional support had positive relationships with department climate (R-H7 and R-H8), indicating that higher amount of mentor sponsorship and higher ratings of institutional support predicted more positive perceptions of department climate among doctoral students. Further, there was a significant positive relationship between institutional support and mentor sponsorship (R-H9), with students who reported higher ratings of institutional support also reporting more mentor sponsorship.

Finally, as mentioned earlier, the hypothesis that group-based negative experience would be negatively correlated with academic confidence (R-H5), and the prediction that importance of graduate experience would moderate the positive association between institutional support and academic confidence (R-H2), were not confirmed. Namely, there was no significant relationship between group-based experience and academic confidence; the path between the importance of graduate experiences by institutional support interaction (the interaction term was created to test the presumed importance of graduate experiences moderator) and academic confidence was not

statistically significant. All significant pathways among variables in the hypothesized model can be found in Figure 2.

There were several significant relationships among the four demographic control variables and variables of interest, shown in Table 11. Because these variables were not the focus of the current hypotheses, they will not be discussed further.

### ***Alternative Models***

Three alternative models were tested. The first alternative model eliminated the path between the importance of graduate experiences by institutional support and academic confidence ( $\chi^2(10) = 12.04$ , *ns*; CFI = 1.00; RMSEA = .02 [90% CI of .00 - .04], PCLOSE = .99; relative  $\chi^2 = 1.20$ ). This model was significantly different from the proposed model,  $\Delta\chi^2(6) = 36.01$ ,  $p < .001$ , with a significantly worse model fit (per the relative  $\chi^2$ ).

The second alternative model, which eliminated both the path between department climate and group-based experience and the path between group-based experience and academic confidence, was then tested ( $\chi^2(12) = 41.65$ ,  $p < .001$ ; CFI = 1.00; RMSEA = .05 [90% CI of .03 - .07], PCLOSE = .54; relative  $\chi^2 = 3.47$ ). Although this model was not significantly different from the hypothesized model ( $\Delta\chi^2(4) = 6.40$ , *ns*), it had poorer fit (per the RMSEA).

Finally, the third alternative model removed all of the paths eliminated in either of the two models described above; basically, it was a model without the hypothesized importance of graduate experience moderator or the group-based experience mediator). This resulted in a poorly fitting model ( $\chi^2(8) = 7.74$ , *ns*; CFI = 1.00; RMSEA = .00 [90% CI of .00 - .04], PCLOSE = .99; relative  $\chi^2 = .97$ ), which was also significantly different from the proposed model ( $\Delta\chi^2(8) = 40.31$ ,  $p < .001$ ).

As these alternate models did not show significant improvements over the hypothesized

model, the hypothesized model was retained.

### ***Multigroup Analysis***

In this stage of the analyses, I investigated the extent of measurement invariance for the finalized general model (see Figure 2) across various social groups (i.e., gender, URM status, international status, and field of study) using multigroup analysis. Specifically, I compared the general model across each of two subsamples reflecting the four social identities of interest (e.g., male versus female for gender comparison) using the goodness-of-fit indices, varying in parameter constraints relating to the factor loadings; for each comparison, in one model the factor loadings were freely estimated across groups, whereas in another they were constrained to be equal between the groups. These model comparisons were made using a scaled chi-square difference test statistic (Satorra & Bentler, 1999) to determine whether the two samples were significantly different from each other (i.e., whether the constrained model was significantly different from the unconstrained model). Next, for each group comparison, I tested the model fit for each of the two samples using the model fit indices and then identified the specific path(s) that contributed to the model fit difference (if any). The following results are organized by the group comparisons made during the analysis.

*Gender.* First, I compared the constrained model (where the factor loadings were constrained to be equal between male and female samples) to the unconstrained model (where the factor loadings were freely estimated across male and female samples). Results from this model comparison revealed that the constrained model had a good model fit ( $\chi^2(44) = 116.59, p < .000$ ; CFI = .99; RMSEA = .04 [90% CI of .03 - .05], PCLOSE = .98; relative  $\chi^2 = 2.65$ ), and imposing the additional restrictions of equal factor loadings across the gender groups resulted in statistically significant different models ( $\Delta\chi^2(16) = 45.29, p < .000$ ). The results indicated that

the finalized general model must work differently across gender.

In the second step, I tested the general model for both male ( $n = 576$ ) and female ( $n = 490$ ) samples. The model fit indices suggested that the model with female sample had a good fit ( $\chi^2(14) = 15.64$ ,  $ns$ ; CFI = 1.00; RMSEA = .02 [90% CI of .00 - .05], PCLOSE = .96; relative  $\chi^2 = 1.12$ ), whereas the model with male sample resulted in a mediocre fit ( $\chi^2(14) = 55.66$ ,  $p < .000$ ; CFI = .99; RMSEA = .07 [90% CI of .05 - .09], PCLOSE = .03; relative  $\chi^2 = 3.98$ ). As seen in Figure 3, almost all significant paths found in the finalized general model were present in the model with the female sample and were in their predicted directions, with the exception that the path between academic confidence and institutional support (R-H1) was not significant ( $\beta = .05$ ,  $ns$ ). For the model with the male sample, all the patterns were generally the same with one exception. Unlike what was found in the general model (as well as the model with the female sample), the pathway between group-based negative experience and academic confidence was statistically significant in this model with male students (see Figure 3); however, the path was not in the predicted direction according to the hypothesis (see R-H5). To inform the understanding of this finding, it is important to note that the difference between male ( $M = .21$ ,  $SD = .30$ ) and female sample ( $M = .37$ ,  $SD = .42$ ) in terms of the mean ratings of group-based negative experience was statistically significant,  $t(990) = -6.84$ ,  $p < .000$ .

*URM status.* While conducting this group comparison, I kept everything in accordance with the finalized general model except for the number of control variables. Due to the limited sample size of the URM participants in the study ( $n = 150$ ), I was not able to include any demographic controls (in this case, ideally, I should have controlled for both gender and field of study; as noted previously, international status was not controllable because URM and international groups were two mutually exclusive samples) while testing the SEM models via

SPSS Amos for this comparison. Without any control variables included, I found that the constrained model (where the factor loadings were constrained to equality between non-URM and URM samples) showed good model fit ( $\chi^2(26) = 89855, p < .000$ ; CFI = .99; RMSEA = .05 [90% CI of .04 - .06], PCLOSE = .63; relative  $\chi^2 = 3.41$ ). In addition, the constrained model was significantly different from the unconstrained model specifying freely estimated parameters ( $\Delta\chi^2(10) = 32.14, p < .000$ ), suggesting that the finalized general model must work differently across both groups.

The model fit indices for the non-URM ( $n = 916$ ) and URM ( $n = 150$ ) samples implied that both models had a mediocre fit (for non-URM sample,  $\chi^2(8) = 43.46, p < .000$ ; CFI = .99; RMSEA = .07 [90% CI of .05 - .09], PCLOSE = .05; relative  $\chi^2 = 5.43$ ; for URM sample,  $\chi^2(8) = 12.92$  *ns*; CFI = .99; RMSEA = .06 [90% CI of .00 - .13], PCLOSE = .31; relative  $\chi^2 = 1.62$ ), and were relatively similar to each other in terms of the degree of fitness. When assessing the specific paths in both models (see Figure 4), it was noticeable that while both models shared similar patterns with the finalized general model, the model with the URM sample had two more non-significant paths. For the model with the URM sample, the hypotheses that institutional support and department climate would be significant positive predictors of academic confidence (R-H1 and R-H4) were not supported ( $\beta = -.36, ns$ ;  $\beta = .09, ns$ ).

*International status.* Results from this model comparison showed that the constrained model specifying full metric invariance across both non-international and international samples had a good model fit ( $\chi^2(38) = 81.44, p < .000$ ; CFI = .99; RMSEA = .03 [90% CI of .02 - .04], PCLOSE = .99; relative  $\chi^2 = 2.14$ ), and did not result in a significantly worse fit than the unconstrained model ( $\Delta\chi^2(14) = 20.59, ns$ ), suggesting that the two groups of students – non-international and international – did not differ significantly from each other. Additionally, path

estimates (see Figure 5) showed that the submodels for both non-international and international groups shared nearly identical patterns with the general model for all participants. The only exception was found among international students; the path between institutional support and academic confidence (R-H1) that was confirmed by both the finalized general model and the model with non-international sample was not significant ( $\beta = .10, ns$ ). Because the two submodels were not significantly different from each, this difference in path coefficients (concerning R-H1) could thus be ignored.

Given the assumption that the hypothesized model was generated for the overall sample instead of certain groups of intersectional identities, I pursued some additional analyses within the group of international students to examine whether their intersectional identities would make a difference (when comparing the paths found in the model with them to those found in the finalized model). Specifically, I looked at the gender by intersectional status intersection to investigate whether international women, by having two marginalized identities, would show a different pattern than their male counterparts (i.e., international men) and the overall sample. Results from this model comparison showed that the constrained model (where the factor loadings were constrained to equality between international male and international female samples) was not significantly different from the unconstrained model ( $\Delta\chi^2(12) = 17.88, ns$ ), suggesting that the finalized hypothesized model works similarly across both international samples. Path coefficients of the model (see Figure 6) also revealed that the model for international women was quite similar to the finalized general model in terms of path direction and level of significance.

For exploratory purposes, I also performed additional group analyses on the non-international sample. Because none of the results produced any interpretable findings, they are

not described here in detail.

*Field of study.* Lastly, with the non-STEM versus STEM comparison, the constrained model was found to have a good fit ( $\chi^2(44) = 121.24, p < .000$ ; CFI = .99; RMSEA = .04 [90% CI of .03 - .05], PCLOSE = .96; relative  $\chi^2 = 2.76$ ) and was significantly different from the unconstrained model ( $\Delta\chi^2(16) = 60.14, p < .000$ ), confirming that the general model works differently across both non-STEM and STEM samples.

Testing the finalized general model for both non-STEM ( $n = 541$ ) and STEM ( $n = 525$ ) samples, I found that the model for non-STEM group fit the data well ( $\chi^2(14) = 18.82, p = .172$ ; CFI = 1.00; RMSEA = .03 [90% CI of .00 - .05], PCLOSE = .94; relative  $\chi^2 = 1.34$ ), and the model for the STEM group had an adequate fit ( $\chi^2(14) = 42.29, p < .000$ ; CFI = .99; RMSEA = .06 [90% CI of .04 - .08], PCLOSE = .16; relative  $\chi^2 = 3.02$ ). I then compared the path estimates of the two models (see Figure 7) and found that the patterns of findings reflected in the finalized general model were present in both models, despite the fact that the pathway between institutional support and academic confidence was not significant for the model with the STEM sample ( $\beta = .08, ns$ ).

Two findings stood out in the intersectional group analyses within the sample of STEM students (due to lack of significance or interpretability, results from additional intersectional group analyses are not presented here). First, when comparing the model for the STEM male sample ( $n = 349$ ) to the model for the STEM female sample ( $n = 176$ ), the constrained model was found to be significantly different from the unconstrained model ( $\Delta\chi^2(14) = 32.94, p = .003$ ), so the general model must work differently across the two samples. Model indices of the two models showed that the model for the STEM male group fitted the data poorly ( $\chi^2(12) = 46.75, p < .000$ ; CFI = .98; RMSEA = .09 [90% CI of .07 - .12], PCLOSE = .01; relative  $\chi^2 = 3.90$ ),

whereas the model for the STEM female sample had a nearly perfect fit ( $\chi^2(12) = 11.05, p = .525$ ; CFI = 1.00; RMSEA = .00 [90% CI of .00 - .07], PCLOSE = .82; relative  $\chi^2 = .92$ ). In addition, one more predicted path was reflected in the model for STEM female (see Figure 8) than the finalized general model; the hypothesis that group-based negative experience would negatively predict academic confidence (R-H5) was moderately supported ( $\beta = -.14, p = .087$ ).

Another intriguing finding was found in the model for the STEM international sample ( $n = 129$ ). In spite of the fact that the constrained model (where the factor loadings were constrained to be equal between STEM non-international and STEM international samples), was not significantly different from the unconstrained model ( $\Delta\chi^2(12) = 12.15, ns$ ), the model for the STEM international group fitted the data nearly perfectly ( $\chi^2(10) = 9.01, p = .532$ ; CFI = 1.00; RMSEA = .00 [90% CI of .00 - .09], PCLOSE = .75; relative  $\chi^2 = .90$ ). Path coefficients for the model (see Figure 9) also showed that the model had mostly similar patterns in comparison with the general finalized model.

## Chapter 4: Discussion

This dissertation examined the extent to which elements of socialization in graduate school (i.e., institutional support, mentor sponsorship, and department climate), as well as individual factors including perceived importance of graduate experiences and group-based experiences, predict doctoral students' academic confidence. The present study extends prior research on academic confidence and socialization to the academy by examining the interconnections of various components of socialization (from the broader issue, *institutional support*, to those more specific issues, *mentor sponsorship* and *department climate*) and identifying their differential effects on academic confidence of doctoral students. This study also contributes to the extant literature by examining whether an intersectional lens facilitates understanding how belonging to multiple minority social groups influences students' graduate experiences and their academic confidence differently than belonging to only one. In addition, the study design made it possible to assess the level of perceived importance of graduate experiences in predicting the degree to which institutional support affects academic confidence among students. Finally, it is important to acknowledge that more intersectional analyses need to be performed to ascertain the particular institutional factor (aside from department climate) that is related to the experience of a particular intersectional social group, and whether/how the relationship may inform various institutional and educational outcomes.

### ***Group Differences on Variables of Interest***

No gender and URM status group differences were found on the primary outcome variable, *academic confidence*, indicating that female and URM doctoral students were as

confident as their male and non-URM counterparts about their academic domain. However, for URM female students who have two intersectioning minority identities, there was evidence that they did have significantly lower academic confidence than both non-URM female and URM male students who have only one minority identity. No additional intersectional group differences on academic confidence were found when taking the field of study (i.e., non-STEM versus STEM) into account; female and URM students in STEM did not differ significantly from their non-STEM peers, and no differences in confidence were found when comparing STEM female URM students to their counterparts with fewer minority identities (i.e., STEM non-URM female, STEM URM male, STEM international female, and non-STEM URM female). These findings partially confirmed the literature that doctoral students who belong to marginalized social groups tend to have lower academic confidence than those in the majority (e.g., Ülkü-Steiner et al., 2000; Jackson et al., 1993); however, with this specific study sample, more than one marginalized identity needed to be present for this to be true.

With regard to graduate experience variables, significant group differences were found, such that female, URM, and international doctoral students rated their perceptions of *institutional support*, *mentor sponsorship* and *group-based experience* more negatively than their male, non-URM and non-international counterparts. Both female and URM students also perceived their *department climate* as more negative than male and non-URM students. This set of findings were largely consistent with results of earlier research that doctoral students who belong to marginalized social groups are likely to have a more negative experience in the academy due to their social group memberships (e.g., Barata et al., 2005; Barnes & Wells, 2009; Yoon, 2013), hold a more negative view of their academic climate (e.g., Gay, 2004; Solem et al., 2004, 2009), and have less access to institutional resources (e.g., August & Waltman, 2004; Olsen et al., 1995;

Sato & Hoge, 2009) and mentoring (e.g., Ibarra et al., 2010; Turner, 2002) than those in the dominant social groups.

Considering the implications from the intersectional perspective (e.g., Crenshaw, 1991; Purdie-Vaughns & Eibach, 2000), results suggested that for URM female students, having multiple minority identities contributed to less access to institutional support and mentor sponsorship, and more negative group-based experience and perceptions of department climate when compared to their non-URM female and URM male peers, with only one minority identity. International female students reported having more negative group-based experience than their non-international and international male peers; however, they did not differ significantly with their peers in ratings of institutional support, mentor sponsorship, and department climate.

Before taking STEM versus non-STEM affiliation into account as an additional intersectional group membership when assessing students' graduate experience, I tested the assumption that STEM students would rate the department climate more positively than non-STEM students, considering that STEM departments are mainly dominated by non-URM men (e.g., Gardner, 2007; Honey et al., 2014; U.S. Census Bureau, 2011) who are less likely to be sensitive to the negative features of their department climate (such as homogenous and exclusive) due to their privileged identifies. The result showed that this hypothesis was supported. Besides, although not hypothesized, STEM doctoral students ( $M = .25$ ,  $SD = .49$ ) were also found to have fewer negative group-based experiences than those in non-STEM fields ( $M = .32$ ,  $SD = .41$ ),  $F(1, 990) = 9.44$ ,  $p = .002$ . This may help us understand some of the unexpected findings produced by the intersectional comparisons of graduate experience variables.

Specifically, results showed that STEM female and STEM URM students who were anticipated to have more negative perceptions of department climate (due to their multiple

minority identities) than their non-STEM female and non-STEM URM peers (who were considered as having only one minority identity) actually rated the climate significantly more positively. Along the same line, unexpected (or opposite) patterns were found when comparing STEM URM and non-STEM URM students on group-based experience, and when comparing STEM URM female and non-STEM URM female students on department climate and group-based experience. Aside from these unanticipated findings, the remaining intersectional comparisons all led to non-significant results except for one comparison; STEM URM female students reported more negative group-based experience than STEM non-URM female students, which was consistent with the hypothesis. Therefore, it was noticeable that the unexpected findings were all based on the comparison by field of study while holding other identity aspects constant (i.e., comparing STEM female vs. non-STEM female, STEM URM vs. non-STEM URM, and STEM URM female vs. non-STEM URM female). Even though no solid theoretical explanation or empirical evidence can be provided at this point to unpack these patterns, considering the finding that STEM students rated the climate more positively than non-STEM students and the fact that STEM fields are less diverse than non-STEM fields demographically, it may be that minority students in STEM had lower expectations of the climate of support they would experience in graduate school than did non-STEM students. Alternatively, because they are relatively rare in the STEM setting, perhaps they were welcomed more warmly and supported better than non-minority students. Another interpretation could be that students in STEM fields are less likely to recognize or identify issues related to climate than non-STEM students due to differences in the disciplinary cultures or resources for doing so.

Finally, the result that international students valued the graduate experiences more than non-international students was not surprising, as the same pattern has been found by a previous

study from the current institution using a similar measure of *importance of graduate experiences* (Curtin et al., 2013). Although we cannot be certain about why international students place greater emphasis on their graduate experiences, according to Curtin et al. (2013), it may be that they are more aware of the great effort and cost associated with their studying abroad experience and therefore value it more than do domestic students.

### ***Socializing Features of Graduate Experience***

As hypothesized, all three components of graduate socialization – *institutional support*, *mentor sponsorship*, and *department climate* – were significant predictors of *academic confidence* for doctoral students regardless of gender, URM status, international status, and field of study. Thus, our findings (based on the finalized general model, see Figure 2) are in accordance with the earlier research that sufficient institutional resources for research, teaching, and professional development (e.g., Wuff & Austin, 2004), adequate and ample support and sponsorship from mentors (e.g., Curtin et al., in press), and positive perceptions of department climate (e.g., Ostrove et al., 2011) positively affect doctoral students' academic confidence in graduate school. In spite of the fact that these three features were all found to be important predictors of academic confidence, group differences emerged when testing the model with different subsamples, indicating that the degree to which features of socialization affected doctoral students' academic confidence depended on their social group membership.

First, when looking at *institutional support* as the predictor of *academic confidence*, results suggested that the expected pattern did not hold true for female, URM, and STEM doctoral students (the relationship was significant for male, non-URM, and non-STEM students). In addition, for groups with intersectional identities, it was clear that institutional support did not predict academic confidence for both STEM male and female students (as previously mentioned,

I was not able to pursue the gender by URM status multigroup analyses due to the small sample size of URM female students). This finding is worth noting because it provides evidence that the current resources and support offered by the institution may not be as desirable to minority and STEM students as to those in privileged groups and in non-STEM fields.

Another important thing to note is that, *importance of graduate experiences*, as hypothesized to moderate the positive association between *institutional support* and *academic confidence*, was not supported by either the general hypothesized model or any of the submodels (despite the fact that most of the models fitted the data well). For exploratory purposes, I also tried testing the model using different subscales of the importance of graduate experiences variable, including the research-related experiences, curriculum-related experiences, and professional development experiences (details of the subscales can be found in Chapter 2 under “Measures”), and the hypothesized moderator did not work for any of the alternative models.

In comparison with institutional support, *mentor sponsorship* proved to be a strong predictor of *academic confidence* for all subsamples of students. The fact that mentor sponsorship was confirmed to have positive effect on doctoral students including those with marginalized identities is an important finding. It strengthens previous research on mentoring (e.g., Eby et al., 2013; Ibarra et al., 2010) by providing empirical evidence that in addition to the “classical mentoring” (i.e., instrumental and psychological support), the sponsorship aspect of mentoring (that mentor-sponsors actively advocates for advancement of their mentees) is important to doctoral students developing academic confidence. For students who belong to marginalized groups in the academy, having someone (and preferably more than one person) go above and beyond role requirements to advocate for them in the field is a powerful source of support that may help them maintain long-term professional success.

Regarding the expected association between *department climate* and *academic confidence*, results from multigroup analyses showed that out of all the subsamples being tested, the subsample of URM students was the only group where results did not appear to support this hypothesis. Though the actual reason behind this particular finding requires further investigation, it may be helpful to refer to Steele's (1992) theory of disidentification. The disidentification theory accounts for both African American students' poor academic performance and their paradoxically high self-esteem. Steele (1992) argued that negative cultural stereotypes depict African American students as intellectually inferior. To protect their self-esteem, African Americans choose to "disidentify" with the school environment, that is, they disengage their self-esteem from the academic environment that may trigger negative experiences for them due to the negative racial stereotypes. In the current study, URM students might have chosen to use the "disidentification" mechanism so that their academic confidence was not influenced by their department climate. It is important to note that these students are obviously not disengaging from academia; but they may be disconnecting their own self-esteem from their perception of how they are perceived by others.

In addition to predicting academic confidence, as hypothesized, both *institutional support* and *mentor sponsorship* were proved to be strong predictors overall of *department climate*. Moreover, consistent with the hypothesis, *institutional support* was also a positive predictor of *mentor sponsorship*. These findings further emphasize the influential role institutional resources and mentor-sponsors play in doctoral students' socialization to the academy, which has been argued by past research (e.g., Austin, 2002; Gardner, 2010). In terms of results from multigroup analyses, the only unsupported path was found among international male students; for these students, mentor sponsorship did not seem to have any relationship with their perceptions of

department climate.

Finally, as anticipated, *department climate* was shown to relate to *group-based experience* such that higher ratings of climate were associated with lower ratings of negative group-based experience. This finding is extremely consistent, since the pathway was found to be statistically significant in all models with different subsamples. Hence, as noted by past research (e.g., August & Waltman, 2004; Solem et al., 2009), we conclude that an academic climate that tends to be alienating, isolating, and unsupportive perpetuates negative experiences on the basis of one's social group membership for all doctoral students.

### ***Considerations of the Conceptual Model***

Concerning the conceptual model tested in the study, results (based on both model fit indices and path coefficients) showed that most of the predicted paths were confirmed by the overall sample of participants and subsamples of interest, suggesting that the proposed links among elements of graduate socialization and academic confidence were verified.

However, in addition to the proposed *importance of graduate experiences* moderator, there was one more hypothesized relationship that was not confirmed in the general finalized model (and the majority of the submodels). Negative *group-based experience*, which was proposed to have a negative association with *academic confidence* (so that lower ratings of group-based negative experience would predict higher academic confidence), did not in the general finalized model (that is, the relationship was not statistically significant). This implies that for the overall group of doctoral students in the current study, the negative treatment they experienced on the basis of their social group membership in graduate school did not necessarily affect how they perceived themselves academically. This finding may also be illuminated by Steele's disidentification theory (1992); perhaps graduate students view these negative

experiences as unpleasant but not as relevant to their confidence that they can succeed in the field.

In terms of the models for subgroups, three of them ended up showing a significant relationship between group-based experience and confidence, but only one of them--the model with the STEM female sample--had the relationship that was in the hypothesized direction. In both the model with the male sample and the model with the non-STEM sample, group-based negative experience was found to have a *positive* effect on academic confidence; that is, for these two groups of students, negative experience was actually associated with higher confidence.

The model with the STEM female sample was the only model that supported the predicted path between group-based experience and confidence, suggesting that for female students in STEM, negative experiences they encountered in their field due to their marginalized female identity do impair their confidence. This supports findings from earlier research that for female STEM students, being negatively stereotyped and feelings of exclusion from one's field were related to lower academic self-concept (Marra, Rodgers, Shen, & Bogue, 2009; Ong, Wright, Espinosa, & Orfield, 2011). The decrease in academic confidence as a consequence of negative experience associated with one's (minority) group membership also corresponds to the implications from stereotype threat theory (Steele & Anderson, 1995). As reviewed earlier, in academic settings, suffering from stereotype threat may result in lower performance (Steele, 1997; Spencer et al., 1999) and reduced sense of belonging to one's field (Steele et al., 2002). Among all groups of students assessed in the study, female STEM students are known as vulnerable to stereotype threat due to their female identity (e.g., Spencer et al., 1999; Walsh,

Hickey, & Duffy, 1999)<sup>4</sup>. Hence, the finding that female STEM students with more negative group-based experience reported have lower academic confidence may be an outcome of the stereotype threat they encountered in their academic environment (which may also explain why a contradictory pattern was found among male students, as the majority of them as non-international white men rarely face that type of threat in their academic life).

Considering the model with male participants, aside from the stereotype threat theory, another argument to account for the counterhypothesized finding is the notion of “reverse discrimination” (or “reverse sexism” in the case of gender-based discrimination). The assumption of reverse discrimination (e.g., Pincus, 2003) suggests that in the context of the allocation of resources, less favorable treatment is given to individuals with privileged group memberships (e.g., men, whites) than to minority group members (e.g., women, non-whites). In the present study, perhaps some male students--especially those with a lot of confidence--who were exposed to negative comments about men attributed those comments to “reverse discrimination.” However, this assumes that confidence leads to the attribution rather than that the attribution boosts confidence.

In terms of the model with the non-STEM sample, in spite of the statistically significant results, given that the finding is unexpected and is difficult to make sense of both conceptually and practically (neither stereotype threat theory nor reverse discrimination applies to the findings for them), no further discussion is appropriate.

In addition, both the model with the STEM female sample and the model with the STEM international sample appeared to have perfect model fit (and better than the general finalized model as well as other submodels). This may suggest that the current conceptual model fits those

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<sup>4</sup> Note that URM students in STEM are under similar stereotype threat conditions due to their racial minority status; however, the small sample size prevented us from looking into the relationship between group-based experience and academic confidence for them.

groups with more extreme experiences better. Thus, in order to make stronger interpretations of the differences in model fit, it would be helpful for future studies to expand the sample size and to test the model in subsamples of STEM URM students, STEM female URM students, and STEM female international students.

### ***Implications for Doctoral Education***

In this study, doctoral students regardless of gender, URM status, international status, and field of study indicated that sufficient institutional support, adequate mentor sponsorship, and positive department climate were significant aspects of the graduate school socialization context that helped them establish their academic self-concept. Institutional support and mentor sponsorship were strongly correlated with each other, and both factors were associated with department climate. Moreover, for students from all demographic groups, positive perceptions of department climate predicted fewer negative group-based experience in their field.

In the current study, about 20% of the participants reported having insufficient opportunities at the current institution for research- and curriculum-related experience and 14% had insufficient professional development opportunities. Group-level comparisons also suggested that students with subordinated identities received significantly less institutional support than their peers with privileged identities. Considering the importance of institutional support, it seems clear that institutions should consider allocating more resources for research, teaching, academic training, and professional development for doctoral students in general. Since the link between institutional support and confidence was not well confirmed for female, URM, and STEM students, future research should examine the reasons behind these results, which may be different for the three groups. Because institutional support did not necessarily help these groups of students increase their confidence academically in the current study, it is also critical

for institutions to make work hard to ensure that the types of support offered to these students are desired and adequate.

Second, given the value of mentor sponsorship both at the contextual- (as a predictor of climate) and individual-level (as a predictor of confidence), it would be helpful to equip faculty members with knowledge and skills to understand the individual differences in needs of their graduate students, and the importance of advocating for their student mentees (particularly those belonging to marginalized social groups who also reported receiving less mentor sponsorship) in addition to providing advice and support. It appears that students view mentor sponsorship as an indication that confidence is warranted. Therefore, it may also be useful to educate administrators at the same time, so they can be better informed when helping students navigate the resources and opportunities available for them.

Furthermore, a positive academic climate was relevant for all groups of doctoral students in terms of their group-based experiences in graduate school; it was also a strong factor in affecting confidence for the majority of doctoral students. For minority students, although not assessed directly in the current study, the significantly worse academic climate and group-based experience they encountered may result in other negative outcomes (such as psychological well-being, career aspirations, etc.) aside from impairing their confidence in the academy. Thus, recognizing the urgent need and developing effective interventions to improve academic climate in general for a diverse group of doctoral students is a meaningful step that both higher education institutions and policymakers should pursue.

### ***Limitations and Future Directions***

Although the present study makes contributions to understanding the influence of various factors on doctoral students' academic confidence, the present research contains several

limitations that must be acknowledged. First, the size of the study sample (especially for the minority groups) was relatively small, which did not allow me to conduct certain intersectional analyses. For example, I was not able to test the finalized general model with the URM female sample because of the limited number of URM female participants in the study. The small sample size also posed a challenge in precluding some statistical analyses. For instance, I was not able to include any control variables in the model with the URM sample. Controlling for gender differences in group-based experience and field of study differences in department climate may be especially helpful to account for differences in the model for URM students (as they consistently appeared to be relevant for other models). In the future, it would be beneficial to increase the sample size of the study (especially consider recruiting more participants from marginalized groups) so that more sophisticated analyses could be completed. With the greater sample size, future studies may also have the capacity to look at other identity dimensions aside from the categories assessed in the current study (e.g., race/ethnicity, country of citizenship, SES status, and relationship/marital status) that are likely to influence students' socialization experiences in graduate school.

A second limitation is that all doctoral students sampled in the study were from one top-tier research institution located in the Midwest. Though the institution was relatively large, we do not know if our results would be applicable to students in other universities that are less research-intensive or in different geographical locations. Hence, we consider that testing our current model and hypotheses with student samples from other institutions that are not research-oriented (and smaller) or in other geographical locations is important. Similar or distinct patterns of findings may emerge that could help different kinds of institutions further understand the graduate experiences of their students and implement policies to better fulfill students' needs and

interests. In less research-intensive and/or smaller institutions where fewer resources are available, for instance, doctoral students may rely less on their own institutions but seek more support from other places, such as professional organizations in the field. Considering students from institutions located in more urban settings (that are more likely to be more demographically diverse), the relationship between department climate and group-based experience may be weaker, as the interactions the students have with their ingroup peers outside of graduate school may be a source of support that diffuses the negative group-based experiences they have in their academic environments.

Additionally, the current study is limited partially due to its cross-sectional research design when trying to establish predictive relationships among variables. The pathways confirmed in the model can only reveal correlational relationships among variables, though predictions were based on theories and other empirical evidence. Students with more negative group-based experience in the academy may tend to hold a negative view of the academic environment they are in such as their own department, which would thus reverse the direction of the my hypothesized relationship between department climate and group-based experience. To provide more informative directions to institutions, studies on socializing features of graduate school and academic-related outcomes could incorporate a longitudinal feature in their design. For instance, future research could survey students' academic confidence at different time points in graduate school (e.g., before entering the program, after reaching candidacy, upon receiving the doctorate degree) and their corresponding ratings of aspects of socialization at that time. This could inform researchers about the stability of academic confidence over the course of graduate school, and the extent to which different socialization experiences contributes to students' academic confidence at varying stages of completion of the degree.

Another limitation of the research design is the self-reported survey measure. The close-ended survey questions might prevent participants from disclosing their experience and feelings more accurately (especially for students with minority identities, as they might feel uneasy responding to certain items used in the survey). In order to address this limitation, future survey studies could include more open-ended questions in addition to close-ended quantitative measures. It would also be helpful to conduct some qualitative studies (e.g., interviews, online discussion forums) to better understand the group-based experiences. Furthermore, including experimental features in the study would help reduce the social desirability and measurement biases associated with relying only on self-reported measures; it could also provide evidence for a given causal relationship of interests.

Finally, it is crucial to acknowledge that implications and suggestions based on current findings are limited because only a selection of study variables were included. It is possible that doctoral students may encounter things relating to academic confidence outside of graduate school. Therefore, the present emphasis on the graduate socialization experience and how that affects students' academic confidence may have underestimated other personal or group experiences (e.g., within their family, community, etc.) doctoral students have while in graduate school.

Table 1. Descriptive Statistics and Bivariate Correlations among All Variables.

	1	2	3	4	5	6	7	8	9	10
1. Gender	--									
2. URM status	.152**	--								
3. International status	-.021	-.215**	--							
4. Field of study	-.246**	-.107**	.062*	--						
5. Institutional support	-.102**	-.091**	-.068*	.010	--					
6. Mentor sponsorship	-.052	-.071*	-.054	-.020	.505**	--				
7. Department climate	-.103**	-.130**	.002	.126**	.654**	.445**	--			
8. Group-based experience	.212**	.429**	.253**	-.097**	-.336**	-.200**	-.425**	--		
9. Academic confidence	-.028	-.029	-.050	-.027	.457**	.418**	.429**	-.178**	--	
10. Importance of graduate experiences	.144**	.105**	.099**	-.126**	-.023	.086**	.021	.116**	.094**	--
Mean	.46	.14	.22	.49	-.01	2.57	3.77	.28	3.12	3.09
Standard deviation	.50	.35	.41	.50	.87	.87	.77	.37	.61	.40

Note.  $N = 1066$ . Gender (0 = male; 1 = female), URM status (0 = non-URM; 1 = URM), international status (0 = non-international; 1 = international), and field of study (0 = non-STEM; 1 = STEM).

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

Table 2. Comparing Groups Differing on One Identity on Graduate Experience Variables.

		Institutional Support	Mentor Sponsorship	Department Climate	Group-Based Experience
female	<i>M</i>	-.11	-.06	3.68	.37
	<i>SD</i>	.91	.81	.84	.42
male	<i>M</i>	.07	.02	3.84	.21
	<i>SD</i>	.83	.76	.70	.30
	ANOVA	$F(1,1062)=11.15$ $p=.001$	$F(1,1047)=2.80$ $p=.095$	$F(1,1052)=11.35$ $p=.001$	$F(1,990)=46.72$ $p<.000$
URM	<i>M</i>	-.21	-.15	3.52	.67
	<i>SD</i>	1.02	.71	.99	.49
non-URM	<i>M</i>	.02	.01	3.81	.22
	<i>SD</i>	.84	.79	.72	.30
	ANOVA	$F(1,1062)=8.84$ $p=.003$	$F(1,1047)=5.27$ $p=.022$	$F(1,1052)=18.18$ $p<.000$	$F(1,990)=223.41$ $p<.000$
international	<i>M</i>	-.12	-.10	3.77	.46
	<i>SD</i>	.89	.82	.83	.42
non-international	<i>M</i>	.02	.01	3.77	.23
	<i>SD</i>	.86	.77	.76	.24
	ANOVA	$F(1,1062)=4.98$ $p=.026$	$F(1,1047)=3.02$ $p=.083$	$F(1,1052)=.01$ $ns$	$F(1,990)=67.55$ $p<.000$

Table 3. Intersectional Comparisons by Gender, URM Status, and International Status.

		Institutional Support	Mentor Sponsorship	Department Climate	Group-Based Experience
URM female	<i>M</i>	-.34	-.24	3.33	.72
	<i>SD</i>	1.04	.75	1.03	.51
non-URM female	<i>M</i>	-.05	-.02	3.77	.28
	<i>SD</i>	.86	.81	.75	.35
	ANOVA	$F(1,486)=8.16$ $p=.001$	$F(1,479)=5.84$ $p=.016$	$F(1,480)=22.46$ $p<.000$	$F(1,455)=101.02$ $p<.000$
URM male	<i>M</i>	.04	-.00	3.87	.57
	<i>SD</i>	.93	.62	.82	.44
	ANOVA	$F(1,147)=4.93$ $p=.028$	$F(1,146)=3.86$ $p=.051$	$F(1,148)=10.87$ $p=.001$	$F(1,141)=3.45$ $p=.065$
intl. female	<i>M</i>	-.17	-.11	3.68	.55
	<i>SD</i>	.84	.79	.88	.45
non-intl. female	<i>M</i>	-.09	-.05	3.68	.32
	<i>SD</i>	.93	.81	.83	.40
	ANOVA	$F(1,486)=.63$ $ns$	$F(1,479)=.34$ $ns$	$F(1,480)=.00$ $ns$	$F(1,455)=32.13$ $p<.000$
intl. male	<i>M</i>	-.09	-.09	3.84	.40
	<i>SD</i>	.93	.84	.79	.37
	ANOVA	$F(1,231)=.52$ $ns$	$F(1,229)=.01$ $ns$	$F(1,222)=1.85$ $ns$	$F(1,205)=6.98$ $p=.009$

Table 4. Comparisons of Academic Confidence by Gender and URM Status.

Academic Confidence		
female	<i>M</i>	3.10
	<i>SD</i>	.66
male	<i>M</i>	3.13
	<i>SD</i>	.57
	ANOVA	$F(1,1055)=.81$ <i>ns</i>
URM	<i>M</i>	3.07
	<i>SD</i>	.69
non-URM	<i>M</i>	3.12
	<i>SD</i>	.60
	ANOVA	$F(1,1055)=.86$ <i>ns</i>

Table 5. Intersectional Comparisons of Academic Confidence by Gender and URM Status.

Academic Confidence		
URM female	<i>M</i>	2.98
	<i>SD</i>	.73
non-URM female	<i>M</i>	3.18
	<i>SD</i>	.64
	ANOVA	$F(1,481)=3.61$ $p=.048$
URM male	<i>M</i>	3.24
	<i>SD</i>	.57
	ANOVA	$F(1,147)=4.71$ $p=.032$

Table 6. Comparison of Department Climate by Field of Study.

Department Climate		
STEM	<i>M</i>	3.87
	<i>SD</i>	.74
non-STEM	<i>M</i>	3.67
	<i>SD</i>	.79
ANOVA		$F(1,1052)=.16.98$ $p<.000$

Table 7. Comparing Graduate Experience Variables and Academic Confidence by Field of Study.

	Institutional Support		Mentor Sponsorship		Department Climate		Group-Based Experience		Academic Confidence	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
STEM female	-.07	.90	-.06	.72	3.85	.79	.33	.36	3.10	.66
non-STEM female	-.13	.91	-.06	.85	3.59	.85	.39	.46	3.10	.66
ANOVA	$F(1,486)=.54$ <i>ns</i>		$F(1,479)=.01$ <i>ns</i>		$F(1,480)=10.80$ $p=.001$		$F(1,455)=2.60$ <i>ns</i>		$F(1,481)=.01$ <i>ns</i>	
STEM URM	-.13	1.06	-.04	.71	3.84	.98	.51	.44	3.14	.70
non-STEM URM	-.25	.99	-.24	.71	3.34	.96	.76	.49	3.03	.68
ANOVA	$F(1,147)=.49$ <i>ns</i>		$F(1,146)=1.94$ <i>ns</i>		$F(1,148)=9.32$ $p=.003$		$F(1,141)=9.27$ $p=.003$		$F(1,147)=.85$ <i>ns</i>	

Table 8. Intersectional Group Comparisons of Graduate Experience Variables and Academic Confidence by Field of Study.

	Institutional Support		Mentor Sponsorship		Department Climate		Group-Based Experience		Academic Confidence	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
STEM URM female	-.15	1.19	-.09	.75	3.72	1.03	.51	.43	3.09	.80
STEM non-URM female	-.05	.84	-.05	.72	3.87	.73	.29	.33	3.10	.63
ANOVA	$F(1,172)=.28$		$F(1,169)=.06$		$F(1,167)=.85$		$F(1,163)=8.71$		$F(1,170)=.01$	
	<i>ns</i>		<i>ns</i>		<i>ns</i>		$p=.004$		<i>ns</i>	
STEM URM male	-.10	.95	.00	.68	3.96	.93	.51	.46	3.19	.61
ANOVA	$F(1,51)=.03$		$F(1,50)=.21$		$F(1,52)=.83$		$F(1,50)=.00$		$F(1,51)=.25$	
	<i>ns</i>		<i>ns</i>		<i>ns</i>		<i>ns</i>		<i>ns</i>	
STEM intl. female	-.12	.84	-.23	.72	3.92	.83	.55	.41	3.04	.73
ANOVA	$F(1,68)=.02$		$F(1,67)=.57$		$F(1,64)=.77$		$F(1,62)=.13$		$F(1,69)=.08$	
	<i>ns</i>		<i>ns</i>		<i>ns</i>		<i>ns</i>		<i>ns</i>	
non-STEM URM female	-.41	.98	-.29	.75	3.18	1.00	.81	.51	2.94	.71
ANOVA	$F(1,94)=1.19$		$F(1,93)=1.35$		$F(1,95)=5.66$		$F(1,92)=7.56$		$F(1,94)=.80$	
	<i>ns</i>		<i>ns</i>		$p=.019$		$p=.007$		<i>ns</i>	

Table 9. Comparison of Importance of Graduate Experience by International Status.

		Importance of Graduate Experiences	
international	<i>M</i>	3.17	
	<i>SD</i>	.42	
non-international	<i>M</i>	3.07	
	<i>SD</i>	.39	
	ANOVA	$F(1,1059)=.10.56$	
		$p=.001$	

Table 10. Standardized Coefficients and Significance Levels for the Hypothesized Model.

Parameter Estimate	Standardized Coefficient
Institutional Support → Mentor Sponsorship	.50***
Institutional Support → Department Climate	.57***
Institutional Support → Academic Confidence	.40**
Mentor Sponsorship → Department Climate	.15***
Mentor Sponsorship → Academic Confidence	.21***
Department Climate → Group-Based Experience	-.36***
Department Climate → Academic Confidence	.19***
Group-Based Experience → Academic Confidence	.02
Importance of Graduate Experience X Institutional Support → Academic Confidence	-.16

Note.  $\chi^2(16) = 48.05, p < .000$ ; CFI = 1.00; RMSEA = .04 [90% CI of .03 - .06], PCLOSE = .76; relative  $\chi^2 = 3.00$ .  
 \*\*  $p < .05$ . \*\*\*  $p < .001$ .

Table 11. Standardized Path Coefficients from Covariates to Variables of Interest.

Parameter Estimate	Standardized Coefficient
Gender <sup>a</sup> → Department Climate	.00
Gender → Group-Based Experience	.23 <sup>***</sup>
URM Status <sup>b</sup> → Department Climate	-.14 <sup>**</sup>
URM Status → Group-Based Experience	1.24 <sup>***</sup>
International Status <sup>c</sup> → Department Climate	.08
International Status → Group-Based Experience	.84 <sup>***</sup>
Field of Study <sup>d</sup> → Department Climate	.23 <sup>***</sup>
Field of Study → Group-Based Experience	.01

Note. <sup>a</sup>. Reference category = male. <sup>b</sup>. Reference category = non-URM students. <sup>c</sup>. Reference category = non-international students.  
<sup>d</sup>. Reference category = non-STEM students.  
<sup>\*\*</sup>  $p < .05$ . <sup>\*\*\*</sup>  $p < .001$ .

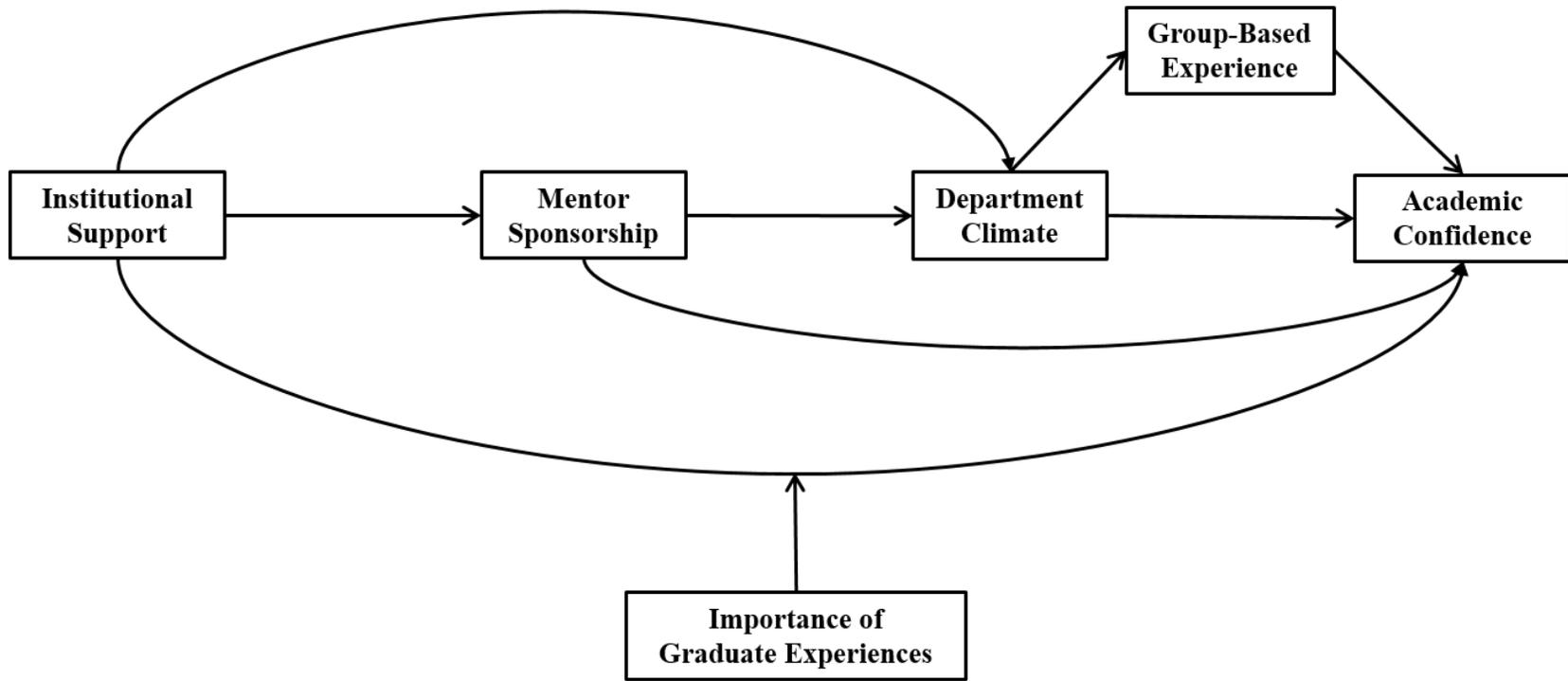


Figure 1. *Hypothesized Model.*

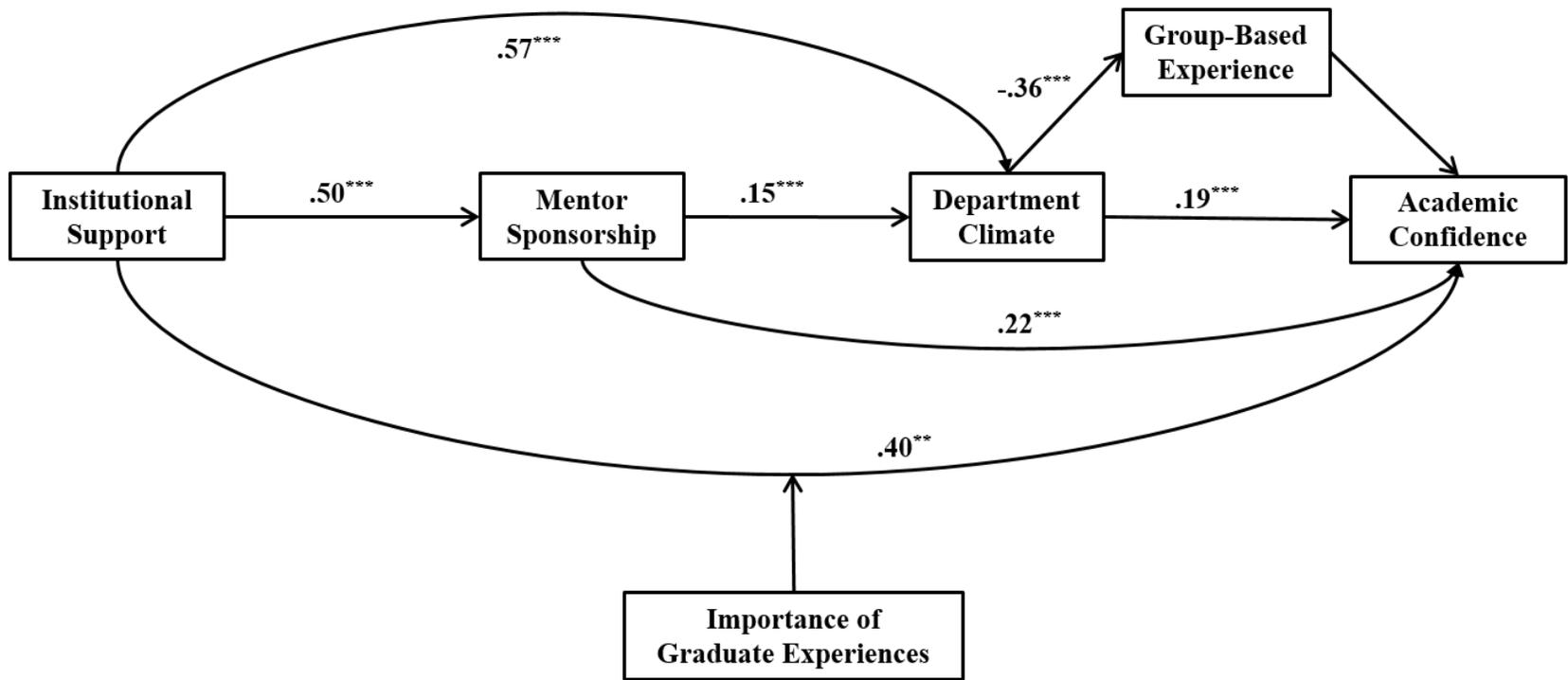


Figure 2. Hypothesized Model with Standardized Coefficients for All Participants.

\*\*  $p < .05$ , \*\*\*  $p < .001$ ; only significant paths are reported; controlling for gender, URM status, international status, and STEM status.

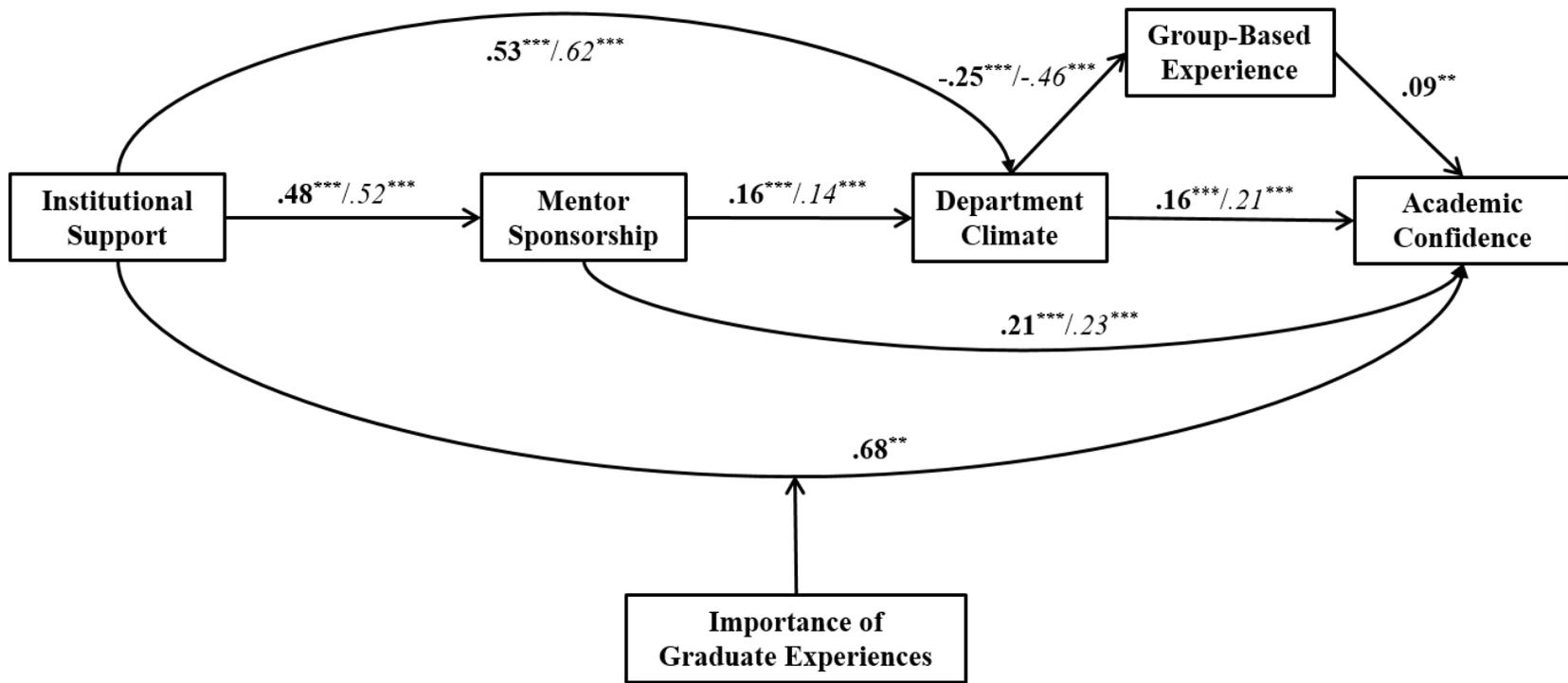


Figure 3. *Hypothesized Model with Standardized Coefficients for Male (bold) and Female (italics) Participants.*  
 $^{**} p < .05$ ,  $^{***} p < .001$ ; only significant paths are reported; controlling for URM status, international status, and STEM status.

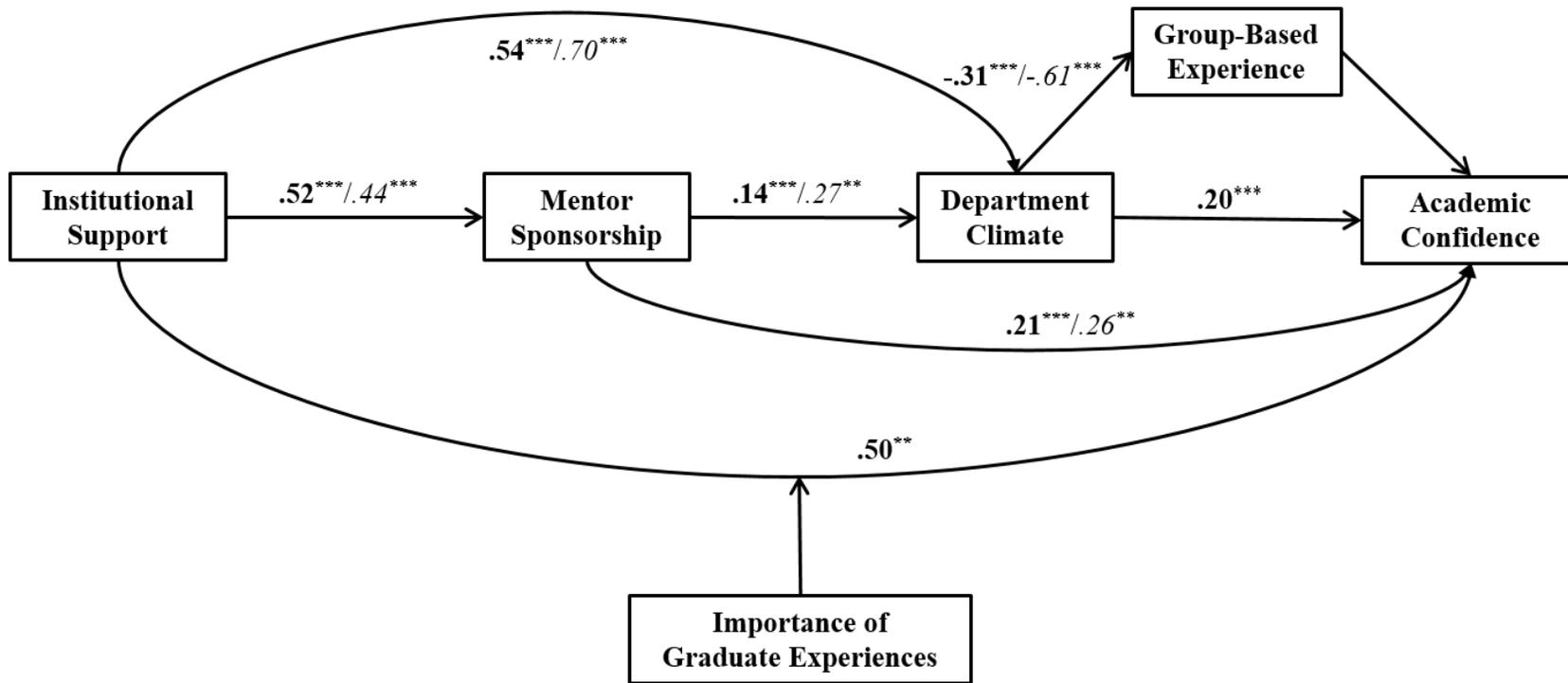


Figure 4. *Hypothesized Model with Standardized Coefficients for Non-URM (bold) and URM (italics) Participants.*  $^{**} p < .05$ ,  $^{***} p < .001$ ; only significant paths are reported; no control variables included due to small sample size.

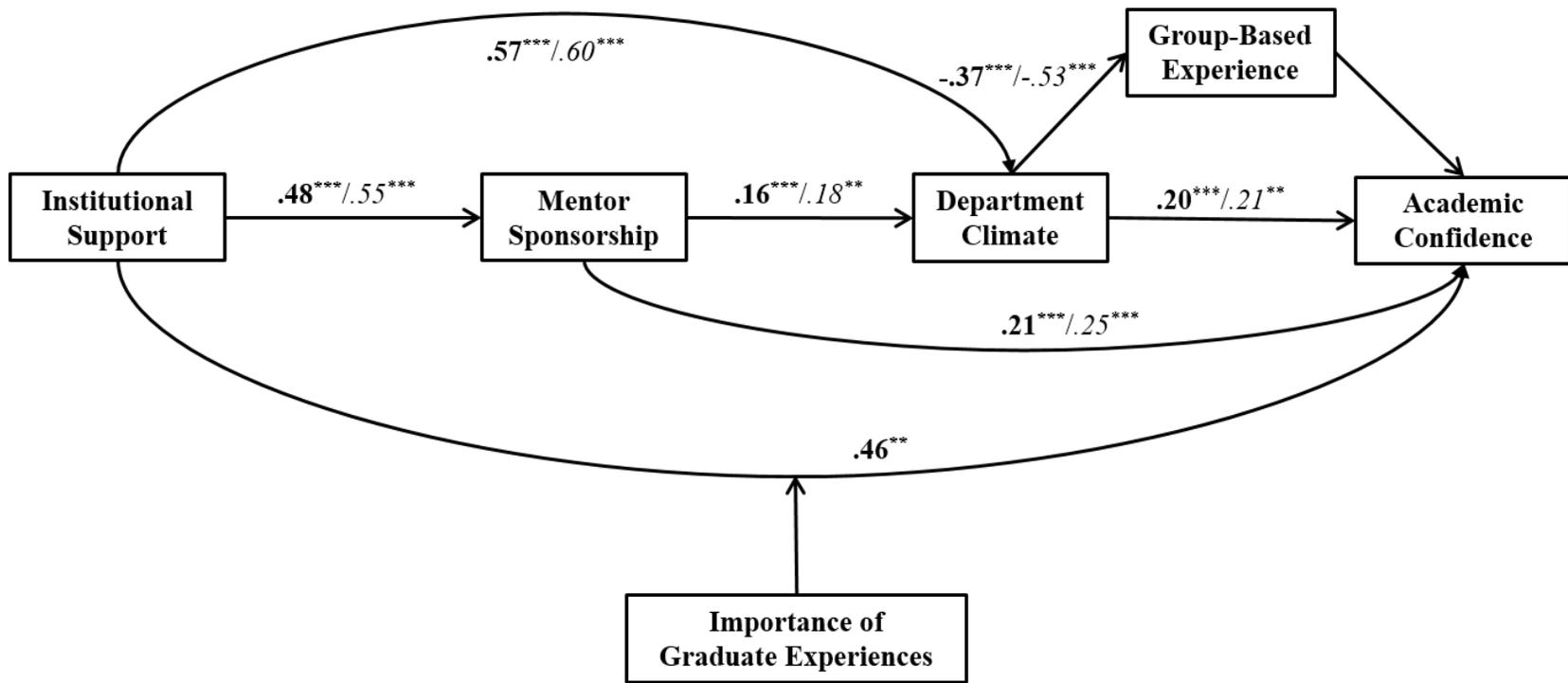


Figure 5. *Hypothesized Model with Standardized Coefficients for Non-international (bold) and International (italic) Participants.*  $^{**} p < .05$ ,  $^{***} p < .001$ ; only significant paths are reported; controlling for gender and STEM status.

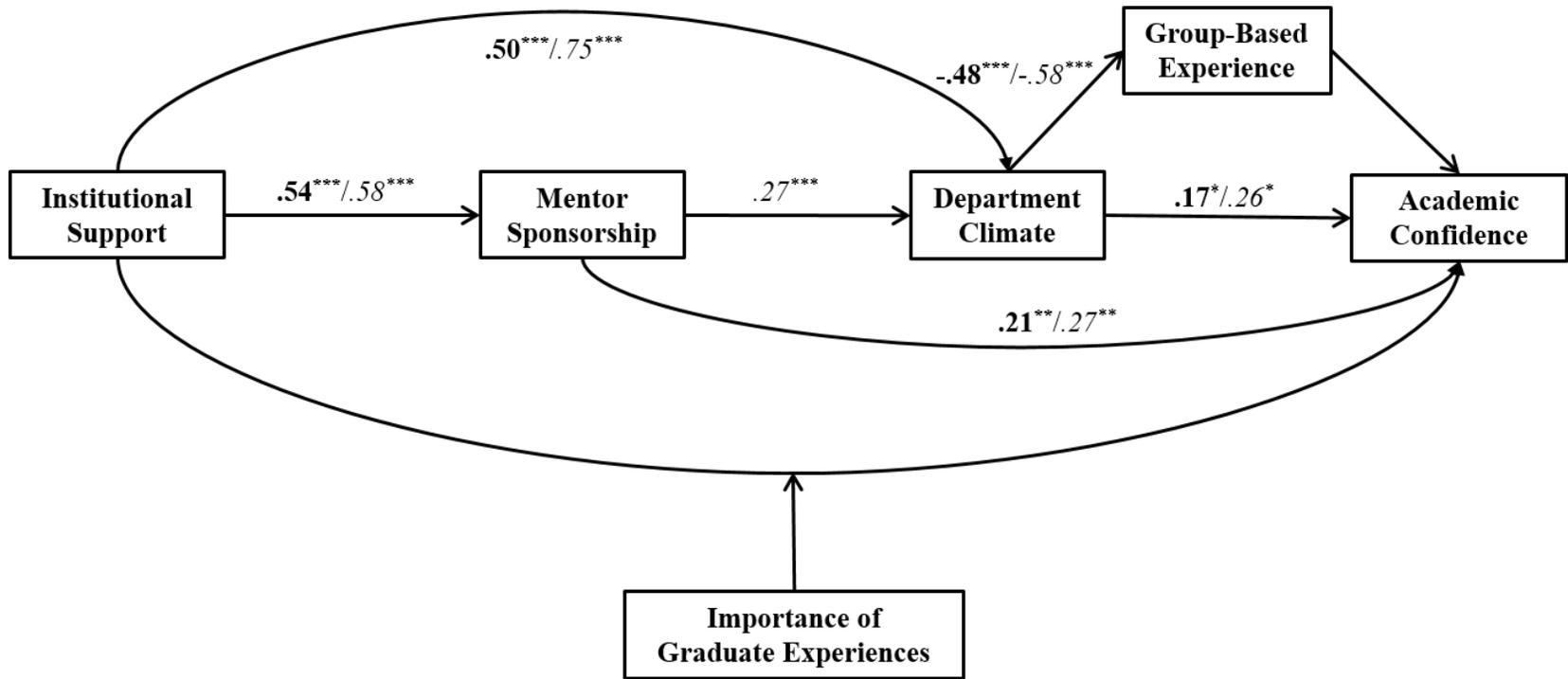


Figure 6. Hypothesized Model with Standardized Coefficients for International Male (bold) and International Female (italics) Participants.

\*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .001$ ; only significant paths are reported; controlling for STEM status.

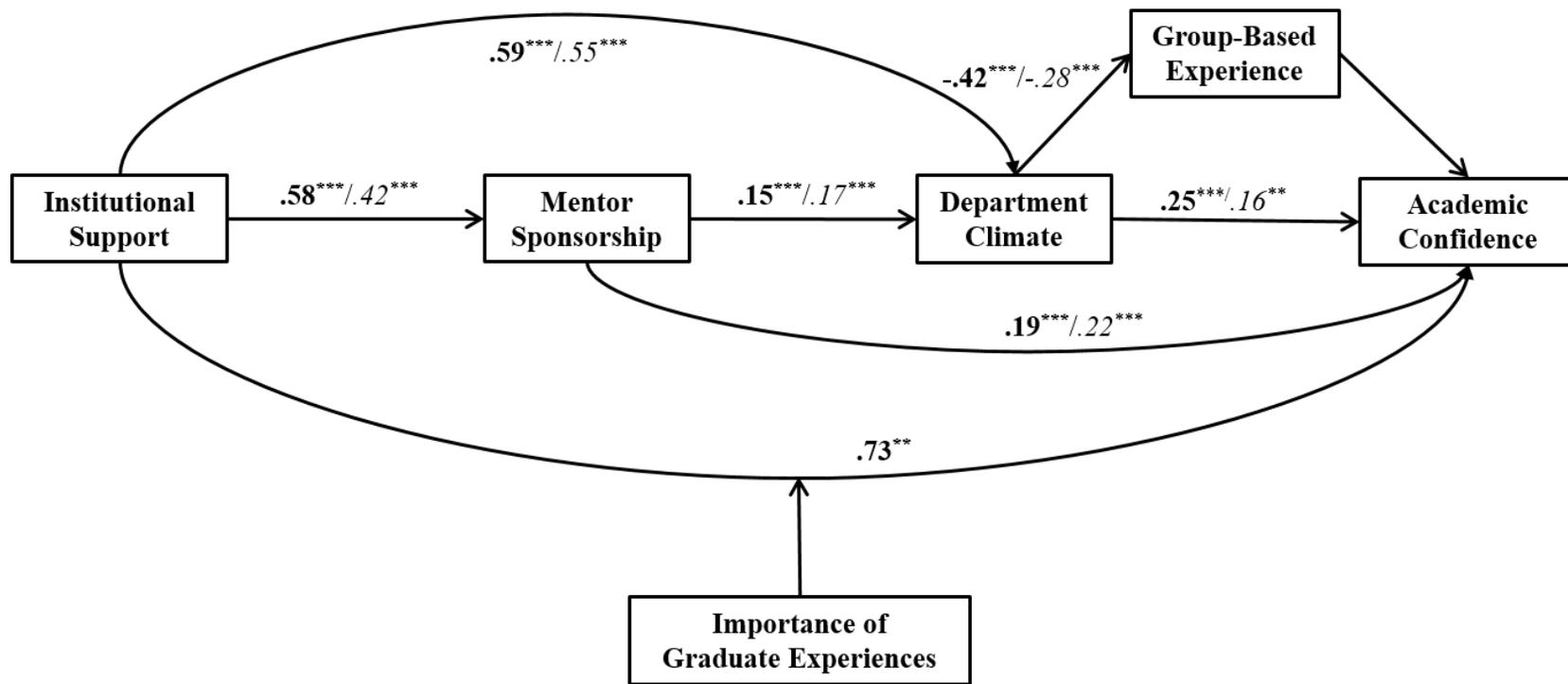


Figure 7. Hypothesized Model with Standardized Coefficients for Non-STEM (bold) and STEM (italics) Participants.  
 \*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .001$ ; only significant paths are reported; controlling for gender, URM status, and international status.

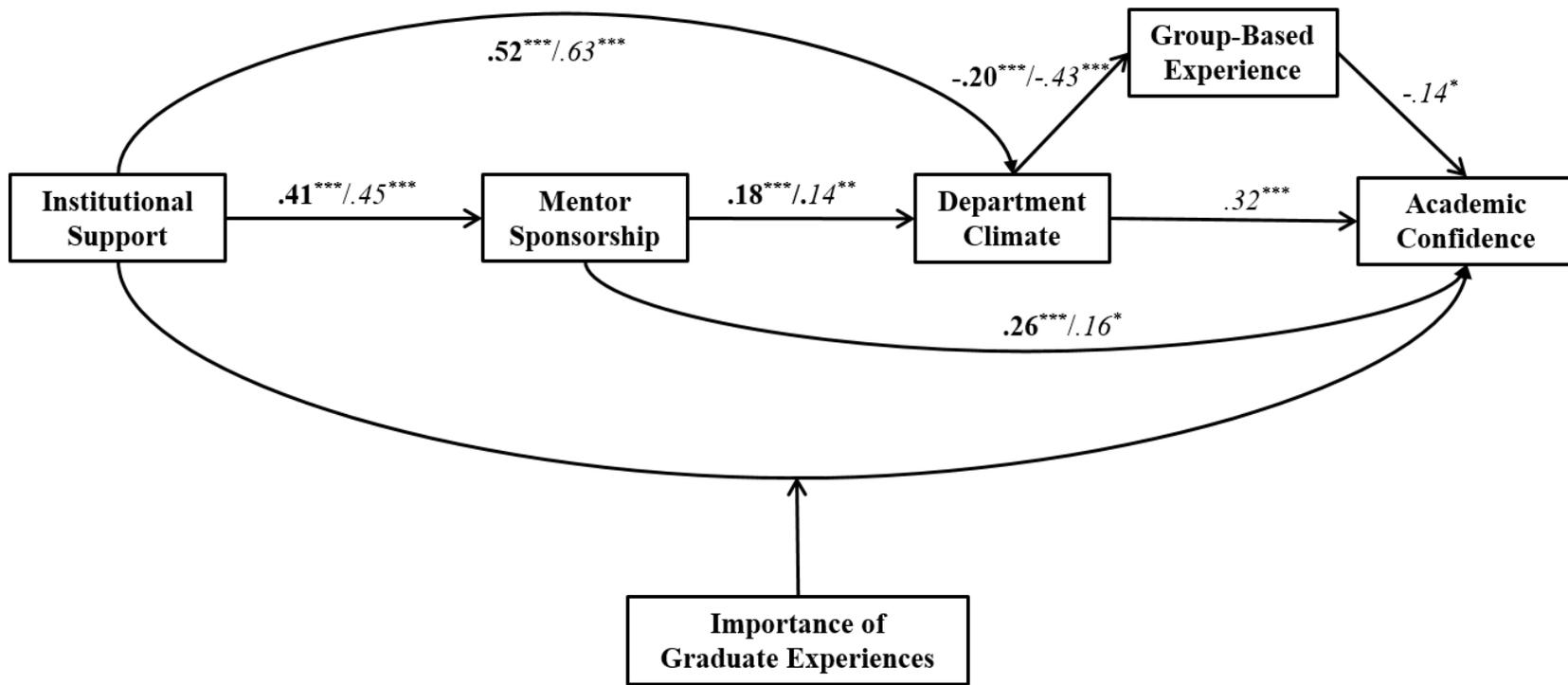


Figure 8. *Hypothesized Model with Standardized Coefficients for STEM Male (bold) and STEM Female (italics) Participants.* \*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .001$ ; only significant paths are reported; controlling for URM status and international status.

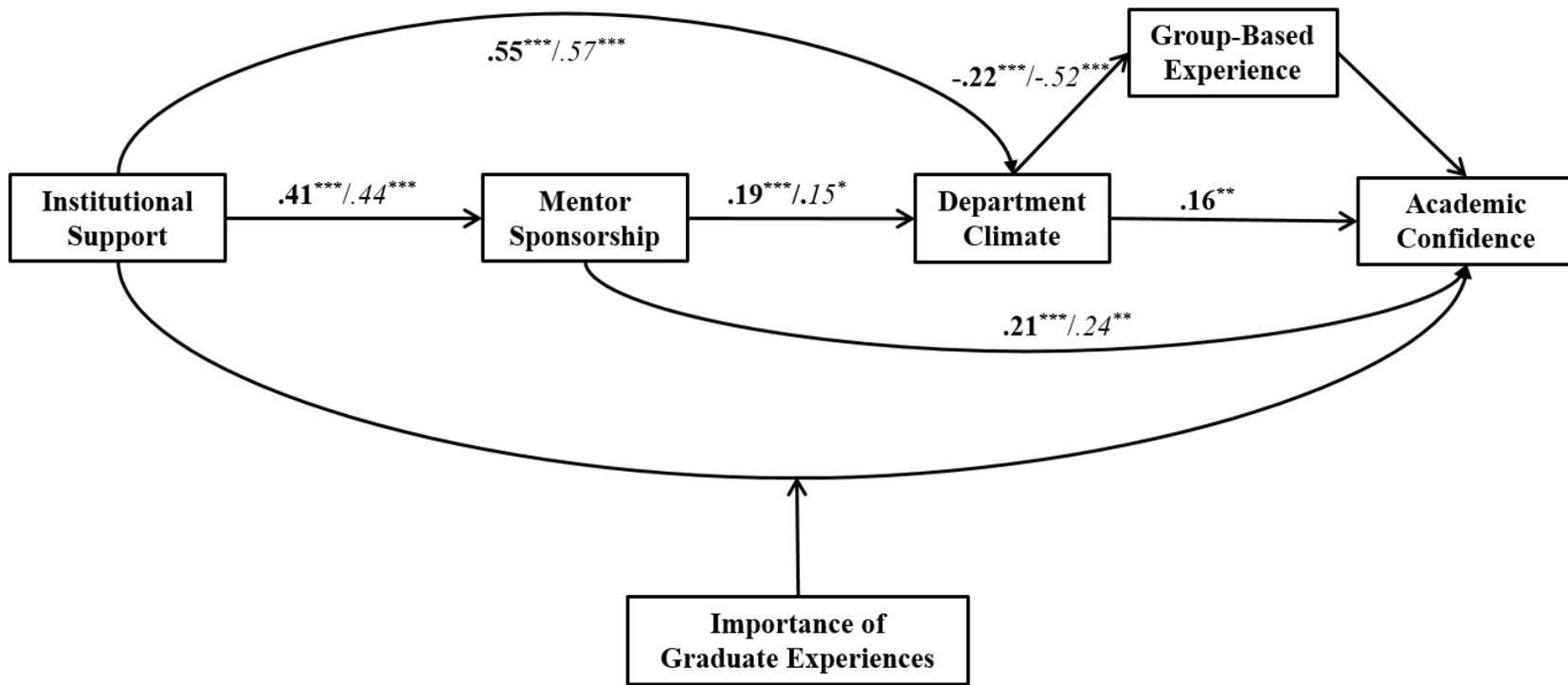


Figure 9. Hypothesized Model with Standardized Coefficients for STEM Non-international (bold) and STEM International (italics) Participants.

\*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .001$ ; only significant paths are reported; controlling for gender.

## **Appendix A: Institutional Support Items**

**Part 1:** Advice & information resources (5-point scale; 1=strongly disagree to 5=strongly agree)

1. I am satisfied with the advice that I receive from sources at UM other than my research advisor (including thesis committee).
2. Department faculty members (other than my doctoral advisor) are readily available for discussions about my research.
3. I am satisfied with the interactions between faculty members and graduate students/postdoctoral fellows.
4. I am satisfied with the interactions among department faculty members.
5. I find the interactions among department graduate students/postdoctoral fellows to be supportive and collegial.
6. Department faculty treat me as a colleague-in-training.
7. The department does a good job at communicating expectations about degree and/or training requirements.
8. [REVERSED] The department is not effective at communicating new policies and new initiatives.
9. [REVERSED] In general, I do not know the function and responsibilities of the department staff.
10. If I need help solving a problem, I know who to talk with in the department.
11. The department staff are helpful, courteous, and respectful.
12. My department training is preparing me well for my future career.

**Part 2:** Sufficient opportunities at UM? (3 subscales, 17-item; 2-point scale, 1=no, 2=yes)

- *Subscale 1:* Research-related

- 1) learning research techniques
- 2) conducting research
- 3) attending professional conferences
- 4) opportunities to present your research
- 5) opportunities to participate in group or collaborative research

- *Subscale 2:* Curriculum-related

- 1) teaching or serving as a GSI
- 2) cognate courses
- 3) elective courses
- 4) courses or training in pedagogy
- 5) interdisciplinary training

- *Subscale 3:* Professional Development

- 1) department lectures, talks, brown bags, or seminars
- 2) meeting outside speakers
- 3) practice interviews and/or job market help
- 4) receptions, parties, and other social events
- 5) non-department lectures, talks, brown bags, or seminars
- 6) study groups
- 7) support groups/support organizations

## **Appendix B: Mentor Sponsorship Items**

**Part 1:** “Number of mentors inside your department who...” (5-point scale; 1 = no mentor, 2 = 1 mentor, 3 = 2 mentors, 4 = 3-4 mentors, and 5 = 5 or more mentors)

- 1) promotes my career through encouraging contacts with other researchers
- 2) advises about career advancement
- 3) advises about departmental/national awards and fellowships
- 4) advocates for me

**Part 2:** Adequacy of the mentorship (4-point scale; 1 = not at all adequate to 4 = very adequate)

- How adequate is the advice you are receiving from your primary advisor?

## **Appendix C: Department Climate Items**

(5-point scale; 1=negative to 5=positive; 13-item adjectives)

1. Alienating/Welcoming
2. Hostile/Friendly
3. Homogenous/Diverse
4. Disrespectful/Respectful
5. Contentious/Collegial
6. Individualistic/Collaborative
7. Competitive/Cooperative
8. Not Supportive/Supportive
9. Rigid/Flexible
10. Threatening/Protective
11. Discouraging/Encouraging
12. Snobbish/Down to Earth
13. Exclusionary/Inclusive

## **Appendix D: Group-Based Experience Items**

("What the environment is like for the group that you belong to?") (0=absent; 1=present)

1. [REVERSED] There is a supportive student community for (men/women/URM/international).
2. Some graduate students have a condescending attitude toward (men/women/URM/international).
3. Some faculty members have a condescending attitude toward (men/women/URM/international).
4. [REVERSED] The department environment is one in which (men/women/URM/international) feel comfortable and are included.
5. [REVERSED] (men/women/URM/international) voice their ideas in meetings and classes as often as students not belonging to this group.
6. Faculty members expect *less* from (men/women/URM/international) than from others.

Non-URM domestic men ( $M = .11, SD = .15$ ); Non-URM domestic women ( $M = .19, SD = .24$ ); URM domestic men ( $M = .59, SD = .45$ ); URM domestic women ( $M = .73, SD = .49$ ); International men ( $M = .40, SD = .37$ ); International women ( $M = .54, SD = .46$ )

**Appendix E:**  
**Academic Confidence Items**

(4-point scale; 1=not all true to 4=very true)

1. I feel confident that I am in the right field.
2. I feel confident that my research interests are considered important in my field.
3. I feel confident that I can be successful in my field.
4. I feel confident that I have received adequate training to be a good teacher.
5. I feel confident that I have received adequate training to be a good researcher.
6. I feel confident in my abilities as a teacher.

## **Appendix F: Importance of Graduate Experiences Items**

("How important is this experience to you personally?") (4-point scale; 1=waste of time to 4=extremely important)

- *Subscale 1: Research-related* (5-item;  $\alpha = .61$ )

- 1) learning research techniques
- 2) conducting research
- 3) attending professional conferences
- 4) opportunities to present your research
- 5) opportunities to participate in group or collaborative research

- *Subscale 2: Curriculum-related* (5-item;  $\alpha = .66$ )

- 1) teaching or serving as a GSI
- 2) cognate courses
- 3) elective courses
- 4) courses or training in pedagogy
- 5) interdisciplinary training

- *Subscale 3: Professional Development* (7-item;  $\alpha = .77$ )

- 1) department lectures, talks, brown bags, or seminars
- 2) meeting outside speakers
- 3) practice interviews and/or job market help
- 4) receptions, parties, and other social events
- 5) non-department lectures, talks, brown bags, or seminars
- 6) study groups
- 7) support groups/support organizations

## Appendix G: Original Climate Survey (Screenshot Version)



### [Department] Ph.D. Student Climate Assessment [year]

#### Introduction

##### Introduction

[Department] is surveying all [faculty, Ph.D. students, postdoctoral fellows, and staff] to assess their overall experiences in the department. This information will be used to identify areas that may need improvement and to help the department make appropriate policy changes to enhance the environment for all.

All information obtained through this survey will be kept strictly confidential. The survey is being administered and analyzed by an external team of survey researchers associated with the ADVANCE Program. No one associated with [department] will have access to the raw data and individual responses. Results will be reported in an aggregate form, with a focus on making recommendations about policies and practices to improve the work environment for everyone in the department; no information that could be used to identify individual persons will be reported. If you have any concerns about answering a particular question, please leave that question blank and move on to the next section.

A report summarizing the data will be prepared for [department].

#### Departmental Curriculum & Activities

*If you need to complete the survey in more than one sitting, please click on the ">>" button at the bottom of this page; this will save your responses. Once you have advanced to the next page of the survey, you may then close your browser window and return to the survey at a later time.*

##### Departmental Curriculum & Activities

Teaching: Please indicate whether or not you have served as a GSI or taught a course at UM.

- I have never taught or served as a GSI since being affiliated with [DEPARTMENT].
- I have taught or served as a GSI since being affiliated with [DEPARTMENT].

During academic year [xxxx-xxxx], please describe your work load related to your professional development:

	too light	appropriate	too heavy	not applicable
coursework	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
GSI (if were GSI)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
GSRA (if were GSRA)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In the table below: First, please select the response that indicates how important to you personally each of the following

experiences is. Second, select the response that indicates whether or not you have had sufficient opportunities for such experiences at UM. Be sure to add any experiences that are not listed but that you believe are important.

	How important is this experience to you personally?					Have you had sufficient opportunities for this experience at UM?	
	waste of time	somewhat important	quite important	extremely important	not applicable	yes	no
teaching or serving as a GSI	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lab meetings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
cognate courses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
elective courses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
prelim or qualifying oral exams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
prelim or qualifying written exams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
learning research techniques	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
conducting research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	waste of time	somewhat important	quite important	extremely important	not applicable	yes	no
attending professional conferences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
internships or industrial experiences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
courses or training in pedagogy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
opportunities to present your research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
department lectures, talks, brown bags, or seminars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
meeting outside speakers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
practice interviews and/or job market help	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
interdisciplinary training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	waste of time	somewhat important	quite important	extremely important	not applicable	yes	no
receptions, parties, and other social events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
non-department lectures, talks, brown bags, or seminars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
study groups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
support groups/support organizations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
opportunities to participate in group or collaborative research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
other (please specify): <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please list additional opportunities that are not currently available that would further enhance your education at UM:



**Mentorship**

*If you need to complete the survey in more than one sitting, please click on the ">>" button at the bottom of this page; this will save your responses. Once you have advanced to the next page of the survey, you may then close your browser window and return to the survey at a later time.*

**Mentorship**

For each item, please select the column that best describes your primary advisor.

My primary advisor:

	strongly disagree	disagree	agree	strongly agree
helps me secure funding for my graduate studies.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is available to me when I need help with my research.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is available to me when I need to talk about other aspects of my program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
teaches me the details of good research practice.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
gives me regular and constructive feedback on my research.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
helps me develop professional relationships with others in the field.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
assists me in writing presentations or publications.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
expects me to work so many hours that it is hard to have a personal life.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	strongly disagree	disagree	agree	strongly agree
encourages me in my research interests and goals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
instructs me in teaching methods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is often not available to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
would support me in any career path I might choose.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

advises about preparation for career advancement.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
advises about getting my work published.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
treats my ideas with respect.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
provides information about career paths open to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	strongly disagree	disagree	agree	strongly agree
sees me as a source of labor to advance his/her career.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
teaches me to write grants/research proposals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
provides emotional support when I need it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is easy to discuss ideas with.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
treats me as a colleague.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
talks with me about the conflicting demands between academia and starting/managing a family.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
advocates for me with others when necessary.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
generally respects opinions of others in the department.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	strongly disagree	disagree	agree	strongly agree
treats me as a whole person - not just as a scholar.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
inspires me intellectually.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
builds my confidence.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
serves as a role model.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
encourages me to attend and present at professional meetings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How adequate is the advice you are receiving from your primary advisor?

- not at all adequate  
 somewhat adequate  
 pretty adequate  
 very adequate

Please indicate the number of mentors inside [department] who provide each of the following kinds of support:

serves as a role model	<input type="text"/>
promotes my career through encouraging contacts with other researchers	<input type="text"/>
advises about career advancement (i.e., postdoctoral positions, jobs)	<input type="text"/>
advises about where to publish my research	<input type="text"/>

advises about departmental/national awards and fellowships

advocates for me

advises about balancing work and other interests

Page 2 of 7

### Advice & Information Resources

*If you need to complete the survey in more than one sitting, please click on the ">>" button at the bottom of this page; this will save your responses. Once you have advanced to the next page of the survey, you may then close your browser window and return to the survey at a later time.*

### Advice & Information Resources

Please indicate how much you agree with each of the following items:

	strongly disagree	disagree	neutral	agree	strongly agree
I am satisfied with the advice that I receive from sources at the University of Michigan other than my research advisor (including my thesis committee).	<input type="radio"/>				
Department faculty members (other than my doctoral advisor) are readily available for discussions about my research.	<input type="radio"/>				
I am satisfied with the interactions between department faculty members and graduate students/postdoctoral fellows.	<input type="radio"/>				
I am satisfied with the interactions among department faculty members.	<input type="radio"/>				
	strongly disagree	disagree	neutral	agree	strongly agree
I find the interactions among department graduate students/postdoctoral fellows to be supportive and collegial.	<input type="radio"/>				
Department faculty treat me as a colleague-in-training.	<input type="radio"/>				
The department does a good job at communicating expectations about degree and/or training requirements.	<input type="radio"/>				
In general, the department is not effective at communicating new policies and new initiatives.	<input type="radio"/>				

	strongly disagree	disagree	neutral	agree	strongly agree
In general, I do not know the function and responsibilities of the department staff.	<input type="radio"/>				
If I need help solving a problem (such as problems with my paycheck, parking, training requirements), I know who to talk with in the department.	<input type="radio"/>				
The department staff are helpful, courteous, and respectful.	<input type="radio"/>				
My department training is preparing me well for my future career.	<input type="radio"/>				

Page 3 of 7

### Career Goals

If you need to complete the survey in more than one sitting, please click on the ">>" button at the bottom of this page; this will save your responses. Once you have advanced to the next page of the survey, you may then close your browser window and return to the survey at a later time.

### Career Goals

Below are goals that many graduate students have for their future. Please rate how attractive each of these goals is to you personally.

	very unattractive	unattractive	attractive	very attractive
become a professor in a top research university	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
get a research job in industry or the private sector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
become a professor in a 4-year college	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
teach in a 2-year college	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
work independently (e.g., consulting, writing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
get a job in a non-profit or government agency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
become a faculty administrator (e.g., department chair, dean, etc.) in a college or university	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
both have children and be a successful academic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
other (please specify): <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please indicate how supportive your advisor is of these same goals.

	not at all supportive	somewhat supportive	very supportive
become a professor in a top research university	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
get a research job in industry or the private sector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
become a professor in a 4-year college	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
teach in a 2-year college	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
work independently (e.g., consulting, writing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
get a job in a non-profit or government agency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
become a faculty administrator (e.g., department chair, dean, etc.) in a college or university	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
both have children and be a successful academic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
other (please specify): <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If it was not listed above, please indicate your career interest here. Write "undecided" if applicable.

Please indicate below your level of agreement with each of the following statements, regardless of whether or not the item is something you are actually interested in pursuing after you complete your degree. Please rate how confident you feel today, not how confident you plan to feel when you graduate.

I feel confident:

	not at all true	a little true	somewhat true	very true
that I can become a professor in a top research university.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that I can get a research job in industry or the private sector.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that I can become a professor in a 4-year college.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that I can get a job in a non-profit or government agency.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that I can become a faculty administrator (e.g., dept chair, dean) in a college/university.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that I can become an administrator/manager in business.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	not at all true	a little true	somewhat true	very true
that I can be self-employed (e.g., consulting, writing).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

that I can be successful in my field.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that I can balance work and personal life to my satisfaction.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that I can get a job as an academic in an appealing geographic location.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that I can both have children and be a successful academic.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that I can make it financially when I get out.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	not at all true	a little true	somewhat true	very true
that I have received adequate training to be a good teacher.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that I have received adequate training to be a good researcher.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that I am in the right field.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
that my research interests are considered important in my field.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
in my ability to obtain funding as a researcher.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
in my abilities as a teacher.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page 4 of 7

#### Department Climate

*If you need to complete the survey in more than one sitting, please click on the ">>" button at the bottom of this page; this will save your responses. Once you have advanced to the next page of the survey, you may then close your browser window and return to the survey at a later time.*

#### Department Climate

Please rate [department]'s climate on the following continua by selecting the appropriate radio button.

welcoming	<input type="radio"/>	alienating				
friendly	<input type="radio"/>	hostile				
racist	<input type="radio"/>	non-racist				
homogeneous	<input type="radio"/>	diverse				
disrespectful	<input type="radio"/>	respectful				
collegial	<input type="radio"/>	contentious				
non-sexist	<input type="radio"/>	sexist				
collaborative	<input type="radio"/>	individualistic				
cooperative	<input type="radio"/>	competitive				
homophobic	<input type="radio"/>	non-homophobic				

not supportive	<input type="radio"/>	supportive				
rigid	<input type="radio"/>	flexible				
threatening	<input type="radio"/>	protective				
encouraging	<input type="radio"/>	discouraging				
snobbish	<input type="radio"/>	down-to-earth				
inclusive	<input type="radio"/>	exclusionary				

Have you experienced bias or exclusion due to your gender, race, or other personal characteristics by members of [department]?

	not at all	to some extent	to a large extent
by a faculty member	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
by a staff member	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
by a student	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How often within the past year have you overheard insensitive or disparaging comments about the following types of people in general, or about particular people as a member of that group, made by faculty, students, or staff in [department]? [This does not refer to comments about an individual as an individual.] Please select one rating for each row. Select "never/NA" if not applicable.

about women in general, or about particular women as "typical" of women

	never/NA	once or twice	three or more times
faculty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

about men in general, or about particular men as "typical" of men

	never/NA	once or twice	three or more times
faculty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

about racial/ethnic minorities, or about particular persons of color as "typical" of a racial/ethnic group

	never/NA	once or twice	three or more times
faculty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

about a religious group, or about particular persons as "typical" of a religious group

	never/NA	once or twice	three or more times
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

faculty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

about sexual minorities (that is, gay, lesbian, bisexual, and transgender individuals), or about particular persons as "typical" of a sexual minority

	never/NA	once or twice	three or more times
faculty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

about individuals based on their political perspectives

	never/NA	once or twice	three or more times
faculty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

For most of the items below, please indicate for which of the following groups you think each item is true. The first item is an indicator of which groups of people are represented in [department]. If there are no members of a particular group represented in [department], select that column. The second row asks you to indicate which of the groups you belong to; please select all that apply.

For the remaining questions, we would like to know your best guess about what the environment is like for each of the following groups. However, if you feel you can't guess how the environment is for groups you don't personally belong to, leave the item blank.

	men	women	international people	underrepresented minorities	sexual minorities	people with disabilities
As far as I know, there are NO students who belong to this group.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I belong to this group.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

In [department]:

	men	women	international people	underrepresented minorities	sexual minorities	people with disabilities
there is a supportive student community for these graduate students.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
some graduate students have a condescending attitude toward members of this group.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
some faculty members have a condescending attitude toward members of this group.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
the department environment						

is one in which these graduate students feel comfortable and are included.

these graduate students voice their ideas in meetings and classes as often as students not belonging to this group.

faculty members expect more from these graduate students than from others.

faculty members expect less from these graduate students than from others.

<input type="checkbox"/>					
<input type="checkbox"/>					
<input type="checkbox"/>					
<input type="checkbox"/>					

Please describe your most important concern about the climate in [department].

Is there any additional information about the climate in [department] that you would like us to know?

Page 5 of 7

### Graduate Student Retention

*If you need to complete the survey in more than one sitting, please click on the ">>" button at the bottom of this page; this will save your responses. Once you have advanced to the next page of the survey, you may then close your browser window and return to the survey at a later time.*

### Graduate Student Retention

Do you think some groups (based on e.g., race/ethnicity, gender, family situation, etc.) of graduate students have higher attrition rates than others in your department?

- yes
- no

If yes, please describe why this may be so.

---

In your opinion, please describe the one, most important issue that needs to be addressed to improve the overall retention rate of [department] graduate students.

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Page 6 of 7

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#### Personal Information

*If you need to complete the survey in more than one sitting, please click on the ">>" button at the bottom of this page; this will save your responses. Once you have advanced to the next page of the survey, you may then close your browser window and return to the survey at a later time.*

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#### Personal Information

Student status:

- pre-candidate
- candidate

Gender:

- female
- male
- transgender or other

Are you married or in a committed relationship?

- yes
- no

If yes, is this person employed?

- no
- yes, part-time
- yes, full-time

If yes, is this person a student?

- no
- yes, part-time
- yes, full-time

Do you have children living with you?

- yes
- no

Please use the following space to add any additional comments.

*Page 7 of 7*

#### Block 8

This is the end of the survey. Please do not click on the "Submit" button below until you have completed the survey. Once you click the submit button, you will no longer be able to access this survey.

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