Department Climate and Student Experience: At the Intersection of Gender and Ethnicity in STEM Graduate Programs

Dawn Loyola, University of California, Riverside
Robin Grebing, Maryville University

Women of color in Science, Technology, Engineering, and Math (STEM) face multiple barriers to success (Ong et al., 2011). Students have different experiences mediated by race or gender, and when these two identities intersect, they face unique challenges. The purpose of this critical quantitative study was to examine department climate and its effect on women of color in STEM graduate programs at several campuses of an R1 state university system. Its focus was to discuss racism, discrimination, microaggressions, and sense of belonging. Using Carl Roger's Person-centered approach (Rogers, 1979), the authors propose solutions such as Appreciative Advising, growth mindset, microaffirmations, high-quality mentoring programs, and the creation of safe spaces. These solutions can be implemented at all levels where an advisor has influence: individual, departmental, and campus-wide.

[doi:10.12930/NACADA-21-09]

KEY WORDS: STEM equity; intersectionality; department climate; graduate students; diversity; gender; ethnicity; safe spaces; microaggressions; microaffirmations; mentoring; person-centered approach, appreciative advising

In the United States today, only a handful of underrepresented minority women make it through the academic pipeline and enter graduate school in the sciences. Women of color in science, technology, engineering, and math (STEM) graduate programs face multiple barriers to completing their programs. There is a significant drop in retention during the transition from undergraduate to graduate school. Graduate programs are not always successful in fostering a supportive environment where female students from underrepresented groups feel welcome (Ong et al., 2011). The so-called *chilly climate* in graduate programs negatively affects graduation rates and student satisfaction (Settles et al., 2017). Students in STEM programs have different experiences in graduate science programs that are mediated by race or gender. When these two identities intersect, there are multiple barriers and challenges not faced by white male students, white female students, or minority male students. The purpose of this study was to examine department climate and its impact on student experience for women of color in STEM graduate degree programs at several campuses of an R1 state university system, hereafter referred to as the West Coast University system (WCU). This topic is relevant to academic advising because advisors can impact the climate of a program based on their interactions with graduate students. There are concrete actions advisors can take to improve the climate. As an advisor of graduate students for 20 years, the first author was curious to know if observations and hunches from advising sessions with students would hold true after a systematic study.

There are very few underrepresented minority students in graduate programs in STEM fields in the United States. The National Science Foundation (2017) defines underrepresented minority groups as Black/African American, Hispanic/Latino, and American Indian/Alaskan Native/Native Hawaiian/Pacific Islanders. The U.S. Department of Education (2018) reported the total percentage of unrepresented students enrolled in graduate programs in 2014 at 23%, with lower numbers in the STEM fields; the National Science Foundation reported the percentage of master's degrees awarded to underrepresented minority students in 2014 was 14%, while the percentage of STEM doctoral degrees was just 8% in 2017.

A lack of diversity leads to an unwelcoming climate for under-represented students (Settles et al., 2017; Vazquez-Akim, 2014). Female graduate students often face unfriendly climates in their programs where discrimination and microaggressions can be common experiences (Figueroa, 2016). In addition, faculty attitudes play a large part in the success or failure of campus diversity efforts. Park and Denson (2009) found that some faculty members believe academic standards are lowered to grant admission to students from diverse backgrounds. Faculty communicate this attitude to the students they teach and supervise through their words and actions both in and outside of the classroom. Consequently, the research supports

that institutional culture plays a central role in ethnic and gender diversity on campus and individual graduate programs (Kniola et al., 2012; Whittaker & Montgomery, 2013).

The lack of ethnic diversity in science graduate programs is an issue for several reasons. The first and most important reason is that the lack of diversity leads to a loss of novel ideas and viewpoints in the academic and scientific communities. When the dominant point of view is one-sided, it diminishes the opportunity for different voices to be heard and slows the rate of scientific discovery (Figueroa, 2016; Kniola et al., 2012; Whittaker & Montgomery, 2013). Secondly, the low percentage of Underrepresented Minority (URM) graduate students translates into lower numbers obtaining jobs in the professoriate. Studies show that when minority undergraduate students do not have role models from their ethnic group available as professors, they are less likely to obtain a graduate degree (Hurlock, 2014; Ong et al., 2011). This becomes a perpetuating cycle in the academic pipeline. Finally, a lack of diversity in graduate STEM programs is an issue of social justice. Every student with the desire and ability to complete an advanced degree deserves the opportunity to do so without facing racism and prejudice. Racism, both overt and subtle, is still present in the culture of graduate programs in the United States (Figueroa, 2016; Figueroa & Hurtado, 2013; Moses, 1999; Ong et al., 2011). Figueroa (2016) demonstrated through her research that URM students who face discrimination and racism in their graduate programs are less likely to complete the degree than those who did not.

Under-represented minority graduate students can feel different because of the lack of diversity in their programs. Due to these feelings of difference and exclusion, they are less likely to complete their programs (Figueroa, 2016; Figueroa & Hurtado, 2013). Advisors can play a vital role in providing these students with a welcoming and supportive environment where they feel a sense of belonging and community.

Theoretical Framework

The researchers viewed this study through the theoretical framework of intersectionality. Intersectionality theory states individuals experience multiple identities simultaneously, which become a single identity greater than the sum of the distinct parts (Jones, 2014). Intersectionality situates identity in the larger culture and power structures that perpetuate inequality (Dill & Zambrana, 2009). The theory provides students with a framework for understanding how their multiple identities, both privileged and marginalized, influence their lived experience (Jones, 2009). As a critical theory, intersectionality seeks social justice by examining the structures of power, privilege, and oppression (Jones et al., 2014). This framework provides advisors with a more understanding and compassionate lens to view their students, giving a more nuanced and deeper understanding of each person on an individual level and how their intersecting identities may inform their experience in graduate school.

Literature Review

Significant key themes of the literature review are a minority-majority society in the United States, how diversity is defined and its importance in higher education, campus and department cultures, fostering a sense of belonging, micro-aggressions, and chilly climate. The literature review provides the background for advisors to understand the broader societal and cultural context influencing the student experience and identifies the need for more research into climate issues and how academic advising can positively impact department climate.

Minority Majority Society

The U.S. population is experiencing a vast shift in demographics. The U.S. Census Bureau (2015) estimated that minority ethnic groups will comprise more than half of the U.S. population by the year 2044. However, the student population of most higher education institutions does not reflect this changing demographic. As of 2017 (the most recent data available), the total percentage of undergraduate students from minority groups was 44% (U.S. Department of Education, 2018). There are a few exceptions to this trend, especially at the undergraduate level. This includes Hispanic Serving Institutions (HSI), Historically Black Colleges and Universities (HBCU), and some public university campuses.

Diversity

Diversity is a term used broadly in higher education. Its dimensions include race and ethnicity, gender, sexual orientation, religion, age, physical abilities, political beliefs, and socioeconomic status (Volckmann, 2012). For the current study, diversity has three meanings.

First, ethnic diversity means there are various ethnic groups represented on campus. Second, gender diversity means whether students identify as male or female. Finally, a third category identifies the intersection of these two categories.

Importance of Diversity in Higher Education

Diversity on campus provides students with opportunities to interact with peers different from themselves, often for the first time, which prepares students to be citizens of an increasingly diverse society (Badley, 2007; Gurin et al., 2002; Moses, 1999). Moses (1999) detailed the racism endemic in higher education and made a case for the importance of diversity as an issue of social justice and equity. In their research, Gurin et al. (2002) found that providing students with chances to interact with diverse students in different academic and social situations helps them develop traits needed to be successful in a democracy, such as intellectual curiosity and active thinking. In an interesting example, findings from a survey at the University of Delaware showed that minority students participate in more extra-curricular diversity activities and were more equipped with the skills needed to succeed in our ever-more diverse society than Caucasian students on campus (Hussain & Jones, 2018). Students who had the opportunity for interactional diversity experiences (Sidanius et al., 2008) had better academic success outcomes in general. Hu and Ku (2003) found positive effects of interactional diversity for students in all institution types, while several other researchers found an increase in complex thinking among students who had interactional diversity experiences (Antonio et al., 2004; Gottfredson et al., 2008; Hurtado & DeAngelo, 2012). Hurtado and DeAngelo (2012) found interactions with diverse peers increased complex thinking in undergraduate students in all majors. Gottfredson et al. (2008) noted that university policies providing students with opportunities for ongoing interactions with diverse peers resulted in students who are academically stronger and better prepared to be fully participating members of a democratic society. As advisors, we can provide the space for students to have these valuable and necessary interactions.

Social Justice

Social justice is about fairness (Rawls, 2009). As Wilson-Strydom (2015) explained, "social justice is about understanding and interrogating how different individuals or groups are faring in comparison with others in a specific context (such as a university) or more broadly in society" (p. 145). Higher education institutions serve to make our society more just and equitable (Brennan & Naidoo, 2008). If underrepresented minority students earned college degrees at the same rates as their white peers, they would gain equal access to the social and financial benefits these degrees impart. Higher education sets the tone for the country regarding diversity issues and helps students understand and live what a diverse and equitable society could be (Gurin et al., 2002).

Importance of Campus Culture in Retaining Minority Graduate Students

Kuh and Whitt (1988) define culture in higher education (i.e., campus culture) as "patterns of norms, values, practices, beliefs, and assumptions that guide the behavior of individuals and groups in an institute of higher education and provide a frame of reference within which to interpret the meaning of events and actions on and off the campus" (pp. 28–29). Perceptions of culture affect success outcomes, which vary based on students' gender, department, or major (Litzler et al., 2005; Settles et al., 2016). Students on campuses which provide them with an environment of opportunities (i.e., with cultural relevance and cultural responsiveness) are more successful than students who cannot live and study in these supportive environments (Museus et al., 2017).

Inclusive Culture

Inclusive culture is a critical factor contributing to successful outcomes for underrepresented students. According to Ong et al. (2018), institutional leaders' actions set the tone for diversity on campus, which often determines if departments create an inclusive culture for their students. Without support by key administrators, it is difficult to enact an inclusive culture. By implementing policies that guard against racism and sexism, universities foster a climate where underrepresented students and faculty feel welcome and valued (Franklin, 2016; Ong et al., 2018). When students feel included, they are more likely to complete their degree and contribute to the campus community.

Sense of Belonging

A sense of belonging is a basic human need and is defined as the feeling that one is cared

about, respected, belongs, is accepted, matters, and has social support on campus (Strayhorn, 2018, p. 4). Sense of belonging is an important positive predictor of persistence for college students (Museus et al., 2016). However, creating a sense of belonging for underrepresented students is where universities have often failed. Franklin (2016) explained that while universities have spent considerable amounts of energy and resources attracting minority students to campuses, less attention has been given to ensuring that they persist in their degrees and feel welcome on campus.

Chilly Climate

According to Litzler et al. (2005), "a chilly climate is defined by the isolation, subtle discrimination and persistent micro-inequalities experienced by women and underrepresented groups in academic settings" (p. 3). Minority students in general (Sanchez, 2019) and women of color in particular (Ong et al., 2018) reported high incidents of social and academic isolation on campuses, marginalizing them within their campus communities. According to Settles et al. (2016), an unsupportive climate can negatively affect students' academic performance and psychological well-being, which in turn leads to lowered perceptions of science performance and feelings of isolation. Women also report more incidents of gender discrimination than men in STEM departments. Per Litzler et al. (2005), this points to the fact that STEM departments "continue to be chilly for women" (p. 13).

Microaggressions

Microaggressions play a significant role in creating a chilly climate and lowering the sense of belonging for women of color in STEM degree programs. Racial microaggressions are indirect, subtle, and often unconscious racist insults (Garcia & Johnston-Guerrero, 2015; Solorzano et al., 2000). Racial microaggressions, whether intended or not, create an environment where minority students feel they are unwelcome and do not belong on campus (Franklin, 2016; Sanchez, 2019). While microaggressions are interpersonal, they are grounded in the institutional racism observed on many campuses (Sanchez, 2019). Sanchez (2019) reported that students in STEM courses reported more incidents of microaggressions in their courses than students in other majors. Ong et al. (2018) noted some examples of microaggressions in STEM, such as hallways lined with pictures of exclusively older white male scientists, a lack of women's bathrooms in engineering buildings on campus, and having minority students' presence questioned by peers and faculty both in and outside the classroom. Many minority students have experienced microaggressions throughout their lives, and a university campus with a chilly climate combined with the stress of postsecondary education proves to be overwhelming (Franklin, 2016).

Methodology

This critical quantitative study measured how graduate students perceive the climate in their departments to discover differences based on gender and/or ethnicity.

Research Question and Hypotheses

Research Question

What is the effect of department climate on student experience for women of color in STEM graduate degree programs at several campuses of an R1 state university system?

Null Hypothesis

Department climate does not affect the student experience for women of color in STEM graduate degree programs at several campuses of an R1 state university system**.**

Alternative Hypothesis

Department climate affects student experience for women of color in STEM graduate degree programs at several campuses of an R1 state university system**.**

Methods/Data Collection Tools

The researchers conducted this study at several campuses of the West Coast University (WCU) system, where the participants were master's and doctoral level students in STEM degree programs. The data collection tool was an existing survey titled *The Science and Engineering Graduate Student Experience Survey* (Litzler et al., 2005), and the survey's authors at the University of Washington Center for Evaluation & Research for STEM Equity granted permission to use the tool. Most of the questions use a three-point Likert scale ("1" = not at all, "3" = very much). The sampling method was purposeful sampling. Master's and doctoral students in the STEM fields at the participating campuses were

Table 1. Since entering your program, have you experienced the following from members of your department, lab, or program: discrimination on the basis of race/ethnicity?

	Not at all	Somewhat	Very much
All others	84.80%	14.50%	0.60%
URM women	62.10%	24.10%	13.80%

sent the survey directly to their university-issued email accounts. As of Fall 2017, 7,220 graduate students who were enrolled in Engineering/Computer Science, Life Science, and Physical Science majors at campuses participated in the study. The final number of participants who submitted a completed survey was 196. Due to the small sample size, the data remained aggregated, and no tests were run by campus or area of research to ensure the privacy of the respondents.

Research Results

Using SPSS, two sets of tests were run on the data from the survey: Chi-square and Fischer's Exact tests (run simultaneously) to examine the distribution of the responses, and independent samples *t*-tests to compare the means between the groups. The tests ran on three different comparison groups: URM women vs. all others, all URM versus all others, and females versus males (respondents who indicated "Other" for gender were excluded from the female versus male comparison). The researcher only used the Fisher's Exact Test results for the distribution due to the small sample size in some of the responses, especially in the URM women vs. all others. In total, 29 URM women responded to the survey, which led to some responses with less than five in a category. Additionally, there were multiple questions with a significant difference in the responses between the groups. All results shown in Appendix 1 are from the Fisher's Exact Test.

Limitations of the Study

One of the authors is an employee of the university system where the survey was administered. Her role as an advisor means direct contact with a sub-set of the students being surveyed. She also supervises a group of other advisors in the college graduate advising center. The power differential could lead to students feeling pressured to complete the survey and/or to report more positive experiences than they had.

Table 2. Do you feel you have been judged negatively on the basis of your race/ethnicity?

	Not at all	Somewhat	Very much
All others	84.80%	13%	1.80%
URM women	58.60%	34.50%	6.90%

Another limitation of the study is its small sample size. The overall population of graduate students is small compared to the undergraduate population, and the number of women of color is even smaller. Currently, 36% of STEM graduate students surveyed were female, and only 10% were URM. Despite the small sample size, the results still have value, as they report on the experiences of a group of students who are traditionally underserved and need attention. In addition, the low response rate could lead to skewed results due to the effects of non-response bias, meaning that students who have had a strong experience (negative or positive) are more likely to complete the survey. A qualitative study with in-depth interviews of some of the respondents would provide a more personal dimension to the research findings; however, it was not possible to include this aspect in the current study due to time constraints.

Findings

Based on the current study's findings, the lead researcher determined that department climate affects student experience for women of color in STEM graduate programs in both positive and negative ways. The hypothesis is accepted, and the null hypothesis is rejected. The findings fall into two broad categories: chilly climate, and department support, mentoring, and student experience.

Chilly Climate

Any environment where discrimination, isolation, and microaggressions are present marks a chilly climate in STEM. The survey responses point to several areas where these factors are present in graduate programs at WCU. As shown in Table 1, more URM women experienced discrimination (37.9% vs. 15.1%), and Table 2 shows those who felt negatively judged based on their race/ethnicity (41.4% vs. 14.8%) than other groups. These results support previous findings

Table 3. Are you encouraged to freely express yourself in class?

	Not at all	Somewhat	Very much
Male	1.40%	37.50%	61.10%
Female	7.00%	54.40%	38.60%

Table 4. To what extent do graduate students in your department compete for grades?

	Not at all	Somewhat	Very much
All others	72.40%	25.20%	2.50%
URM women	58.60%	27.60%	13.80%

Table 5. Do you feel singled out in class to speak on behalf of your race/ethnicity?

	Not at all	Somewhat	Very much
All others	93.20%	4.80%	2.00%
URM students	77.10%	14.60%	8.30%

by Sanchez (2019) and Figueroa (2016). In addition, 23% fewer female than male respondents were encouraged to express themselves freely in class (Table 3). This finding confirms research by Litzler et al. (2005) that women report more incidents of gender discrimination than men in STEM departments.

Table 4 illustrates that URM women perceived more competition for grades than other groups (41.1% vs. 27.7%). A competitive environment is also an indicator of an unsupportive climate that, according to Settles et al. (2016), can negatively affect students' academic performance and psychological well-being.

Table 5 shows that more URM students felt singled out in class to speak on behalf of their race/ethnicity compared to other groups (22.9% vs. 6.8%), while Table 6 shows that more females felt singled out in class to speak on behalf of their gender (17.6% vs. 2.8%). This singling out can be considered a microaggression, present more often in STEM classes than other courses offered on campus (Ong et al., 2018).

Finally, more than half of the URM women (51.7%) surveyed reported feeling very much or somewhat isolated (Table 7). This data confirms previous research by Ong et al. (2018) in which

Table 6. Do you feel singled out in class to speak on behalf of gender/gender identity/ gender expression?

	Not at all	Somewhat	Very much
Male	97.50%	1.40%	1.40%
Female	82.50%	13.20%	4.40%

Table 7. Since entering your graduate program, have you experienced isolation?

	Not at all	Somewhat	Very much
All others	59.6	28.9	11.4
URM women	48.3	17.2	34.5

Table 8. Has your program encouraged interdisciplinary research?

	Not at all	Somewhat	Very much
All others	16.3%	38.8%	44.9%
URM students	14.6%	19.1%	63.8%

URM women reported high incidents of social and academic isolation on campus.

The presence of all of these factors – feeling singled out in class and judged negatively, being asked to speak on behalf of their group, and experiencing discrimination, isolation, and microaggressions – make it clear there is a chilly climate present in STEM graduate programs in the West Coast University system, a finding which has implications for a negative science culture for all students (Harrison & Tanner, 2018).

Department Support, Mentoring, and Student Experience

Surprisingly, despite the chilly climate present, URM students reported positive experiences in their programs. As illustrated in Table 8, URM students perceived their programs as encouraging interdisciplinary research more than other groups (64.4% vs. 44.9% chose "very much"). However, Table 9 shows that they felt access to equipment was a barrier more than other students (16.7% vs. 7.8% chose "very much"). These two findings are diametrically opposed but can also indicate how the department speaks about interdisciplinary research. Still, at the level of the individual lab, URM students face more barriers when

Table 9. Is access to lab equipment and instrumentation a barrier to the pursuit of your personal research goals?

	Not at all	Somewhat	Very much
All others	56.50%	35.70%	7.80%
URM students	66.70%	16.70%	16.70%

Table 10. Were you influenced by others to pursue a science and/or engineering degree: mentors?

	Not at all	Somewhat	Very much
All others	26.80%	35.20%	38.00%
URM students	17.00%	19.10%	63.80%

Table 11. How confident are you with regard to your ability to complete your degree?

	Not at all	Somewhat	Very much
All others	1.40%	45.90%	52.70%
URM students	6.30%	29.20%	64.60%

attempting to access equipment to do their research, and a lack of access to equipment can slow progress toward the degree.

Mentors influenced a majority of URM students (Table 10) at the rate of 25% more than other groups (82.9% vs. 63.2%). Previous research shows that high-quality mentoring relationships are positively correlated to student persistence and retention (Bair & Haworth, 2004; Rogers & Molina, 2006), which is an important factor in student success. Table 11 clearly shows that URM students were most confident in their ability to complete their degrees (64.4 vs. 52.7% choosing very much). Even though many URM students are confident in their ability to complete their degree, Table 11 demonstrates there are also more who are not (6.3% vs. 1.4%).

There are some areas of success for URM women in STEM. For example, Table 12 highlights that 90% of URM women felt their department provided them with the skills and knowledge needed to write a winning funding proposal compared to 70% of other respondents. Table 13 shows that 100% of URM women are very much or somewhat positive that their graduate training will or has prepared them for

Table 12. Do you feel your academic department has provided you with the skills and knowledge to write a winning proposal for funding?

	Not at all	Somewhat	Very much
All others	32.10%	47.50%	20.40%
URM women	10.30%	51.70%	37.90%

Table 13. How well do you think your graduate training will or has prepared you for a job in an academic setting?

	Not at all	Somewhat	Very much
All others	4.20%	56.60%	39.20%
URM students	0.00%	34.50%	65.50%

Table 14. Has your graduate program experience reaffirmed your career choice?

	Not at all	Somewhat	Very much
All others	17.30%	42.00%	40.70%
URM women	13.80%	75.90%	10.30%

a job in an academic setting. As prior studies have shown, students who perceived their department was supportive had a 64% decrease in low career commitment (Litzler et al., 2005). These findings could point back to the fact that mentors more greatly influence URM students than others (as shown by the data presented in Table 9), and the effect of a positive mentor helps mitigate the effects of the chilly climate (Dixon, 2014).

Despite their confidence in their ability to find a job in an academic setting, Table 14 shows that URM women also reported lower career commitment than other groups; only 10.3 % of URM women vs. 40.7% of all other respondents responded "very much" to the question "has your graduate experience reaffirmed career choice?" This is a concern since the pipeline lacks qualified URM women who can move into postdoctoral and tenure-track academic positions after graduate school.

Discussion and Implications for Advising Practice

It is clear from the findings that a chilly climate is present in STEM graduate programs in the WCU

system. This climate cuts across campuses and departments and is felt by URM students and women differently. So, what can advisors do to foster a sense of belonging and an inclusive climate? The researchers propose several actions that can be taken at the individual, department, and campus levels.

At the individual level, we can use affirming and inclusive advising techniques to foster our advisees' sense of well-being and belonging. When applied to advising practice, Carl Rogers' Person-centered Approach provides an immediately effective way to meet students where they are. The central idea of this approach is "the individual has within him or herself vast resources for self-understanding and for altering their self-concepts, basic attitudes, and self-directed behavior; these resources can be tapped if a definable climate of facilitative psychological attitudes can be provided" (Rogers, 1979, p. 1). These attitudes are genuineness on the advisor's part, unconditional positive regard for the student, and empathic understanding (Rogers, 1979). Rogers was a professor of psychology at the University of Chicago from 1945-1957 and did a large portion of his research at the college counseling office he founded there, and later at the University of Wisconsin-Madison (Motschnig, 2012). While the research was done with a mostly white, male, college-aged population, it has proved to be applicable in a wide range of settings, with people of all ages and from all walks of life. The approach is accessible and does not require extensive training for advisors to implement. It simply requires a willingness on the advisor's part to keep an open heart and mind, give the student their undivided attention, and listen actively. As an advisor, the lead author uses this approach as the foundation of the advising practice, and it continues to be a powerful and effective tool 20 years later.

Appreciative advising fits perfectly within the human-centered approach. Using positive questioning, appreciative advising "aims to identify personal strengths and sources of motivation to heighten individual potential" (Huston & Bloom, 2007, p. 4). This student-centered advising approach provides a positive and affirming framework to move graduate students through their degree programs with an enhanced sense of self-worth.

Advising from a Growth Mindset point of view is another effective approach that students desire. Carol Dweck (2007) defined a growth mindset as "based on the belief that your basic qualities are things you can cultivate through your efforts, your strategies, and help from others" (p. 7). This is where the advisor can intervene, helping the student to create strategies, identify where to apply effort to improve, and cheer on successes.

A powerful tool to create more positive and affirming student interactions is through micro-affirmations. Rowe (2008) defined microaffirmations as "apparently small acts, which are often ephemeral and hard-to-see, events that are public and private, often unconscious but very effective, which occur wherever people wish to help others to succeed" (p. 1). Microaffirmations can have a positive effect on academic performance. For example, high school students whose teachers received training on microaffirmations and other strategies to improve classroom climate had higher pass rates (3.8 times for females and 2.6 times for males) than teachers who did not receive the training (Morrell & Parker, 2013). Researchers point to the importance of micro affirmations in the advising of college students (Ellis et al., 2019; Lee, 2018). Ellis et al. (2019) noted the positive experience of mentoring and advising lets students know they can succeed in academics and life. Kyte et al. (2020) clearly showed that micromessaging by academic advisors is directly linked to increased student success and satisfaction. Their study compared appreciative and growth mindset messaging, and found that while students valued both, they considered growth mindset messaging to be more helpful. Lee (2018) stated that an advising space characterized by microaffirmations and safety provides college students with a place to develop in positive ways. Advisors who guide and support students with microaffirmations gives them a safe place to ask questions about academic and career options. Advisors can weave microaffirmations into the advising relationship in email communications and one-on-one advising appointments if they know their students well and are committed to building ongoing relationships.

Also important at the individual level is recognizing the impact of an effective mentor. Mentors play a key role in the graduate student experience, which the current study reinforced, with URM students' indicating they were more influenced by a mentor than other groups. High-quality mentoring relationships that exhibit trust, flexibility, collaboration, and feedback positively correlate with student persistence and retention (Bair & Haworth, 2004; Rogers & Molina, 2006). Soto and Yao (2010), in qualitative interviews with

female doctoral students in STEM degree programs, noted that faculty mentors who offered personal support helped students stay in the program and made them more satisfied with their experience. Gardner (2010), in a study of doctoral students at a single institution, found the students in math and engineering programs used their faculty research advisor for support more often than students in non-STEM majors, indicating the importance of mentoring for STEM graduate students.

Effective and comprehensive mentoring programs can be put into place at the department and campus levels that guide graduate students through the entire process, from matriculation to graduation and into a career in their chosen field. Sustained and targeted mentoring can counter the isolation that can occur and keep students on track to graduate and move successfully into a career. The researchers also recommend programs that connect URM students with professional organizations such as the Society for the Advancement of Chicanos and Native Americans in the Sciences (SACNAS), the Annual Biomedical Research Conference for Minority Students (ABRCMS), and the National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM). These organizations connect students with peers, mentors, and professionals outside of their home institution, provide a supportive community of other URM scientists, and expand access to career opportunities in academia, government, and industry.

Advisors and administrators can create safe spaces for URM students at the department and campus levels. The details of the safe space may vary depending on available resources (i.e. space or money), but no matter the configuration, it is a factor in creating an inclusive climate (Ong et al., 2018; Settles et al., 2016). McArthur (2016) explained this as a space in higher education where people can interact openly while feeling safe to explore and learn. A department can establish this space by providing a physical space along with monetary and staff resources to the group, or students can create a space informally either on or off-campus to support one another. This is a place where academic advisors can step in and provide a safe space in the advising office, with the support of the advising and/or department administration. Safe spaces are also found in national STEM organizations geared toward minority students, such as SACNAS, ABRCMS, and GEM. Ong et al. (2018) stated that campus safe spaces enhance STEM persistence by women of color and in the broader scientific community (2017). Several researchers pointed to the importance of a supportive, positive campus climate that correlates to greater persistence and success for women of color in STEM (Franklin, 2016; Litzler et al., 2005; Ong et al., 2018). Advisors can serve as a bridge, connecting students to resources on-campus or from various regional and national organizations.

Areas for future study include another cross-sectional survey to the same three campuses to gauge if department climate has shifted since the pandemic, administering the survey across more campuses in the university system to obtain a larger sample size, and a longitudinal survey to determine if students' perspectives on climate change during their graduate program. Another idea is to conduct a survey to gauge alumni perceptions after graduation. Finally, a survey of students who identified as genderqueer would provide an additional perspective on department climate. The number of students who identified as genderqueer was quite small and did not provide enough responses to break out the group for comparisons, and was beyond the scope of the current study.

Conclusion

Department climate affects student experience for women of color in STEM graduate programs. The theory of intersectionality provides a framework for understanding how their multiple, intersecting identities influence the graduate school experience for this group. Despite the chilly climate present, URM women reported more positive experiences than other students in some areas. Individuals and departments can take concrete actions to effect change, including: implementing the person-centered approach to create a supportive and welcoming climate and sense of belonging; practicing appreciative advising practices to connect students to their dreams and goals; providing growth mindset microaffirmations to affirm students' inherent value and strengths and to help them identify areas for improvement; utilizing effective mentoring by both faculty and staff advisors; and creating safe spaces as a counter to the chilly climate present in many departments. As advisors, we can advocate for our students to ensure policies that allow every qualified student to thrive and achieve their highest potential.

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Authors' Notes

I (Dawn Loyola) want to thank my chair, Dr. Robin Grebing, for successfully guiding me through my degree program relatively in one piece and helping me to stay sane through the research and writing process. In addition, a huge shout out to my director, Kathy Redd, for giving me the space and opportunity to pursue my degree while being employed full time, and to Dr. Karen Xu in the UCR Statistics Collaboratory for her timely suggestions regarding the data analysis for my dissertation and manuscript. Finally, and most importantly, I want to thank my family for supporting me through the long and sometimes rocky writing process. I would not have been able to do this without your loving support and endless patience.

Dr. Dawn Loyola is the Director of Graduate Student Advising for the University of California Riverside, College of Natural & Agricultural Sciences Graduate Student Affairs Center. She has been involved in graduate education at the University of California for over 20 years. She earned her Ed.D. in Higher Education Leadership in Spring 2020 from Maryville University in St. Louis, MO., and her M.A. in Transpersonal Psychology in Spring 2016 from Sofia University-Institute of Transpersonal Studies in Palo Alto, CA. Her research is on department climate and graduate student experience for women of color in STEM, and she has been involved in forwarding DEI issues throughout her career. She has been an active member of NACADA since 2016 and is a proud member of the Advising Graduate and Professional Students Community. Dr. Loyola may be reached at dawn.loyola@ucr.edu.

Dr. Robin Grebing is an assistant professor of higher education leadership at Maryville University, St. Louis. Dr. Grebing has over 12 years of administrative experience at two- and four-year institutions of higher learning. Dr. Grebing is a change agent across many roles, introducing retention planning, an intrusive advising model she calls "flipped advising," and course development processes. Additionally, she supervised the planning and implementation of a community portal and migration to cloud services for the learning management system.

Appendix 1. Responses to The Science and Engineering Graduate Student Experience Survey by Participant Category Comparison Where Significance was Found

Question	Category	Very Much	Somewhat	Not at all	*p*
Do you feel you have been judged negatively based on your race/ethnicity?	URM Women	6.9	34.5	58.6	.004**
	All Others	1.8	13.3	84.8	
	URM Students	6.3	33.3	60.4	.000**
	All Others	1.4	10.9	87.8	
To what extent do graduate students in your department compete for grades?	URM Women	13.8	27.6	58.6	.029*
	All Others	2.5	25.2	72.4	
	URM Students	10.4	31.3	58.3	.018*
	All Others	2.1	23.4	74.5	
Since entering your program, have you experienced the following from members of your department, lab, or program: discrimination on the basis of race/ethnicity?	URM Women	13.8	24.1	62.1	.001**
	All Others	0.6	14.5	84.8	
	URM Students	10.4	20.8	68.8	.000**
	All Others	0.0	14.3	85.7	
Since entering your graduate program, have you experienced isolation?	URM Women	34.5	17.2	48.3	.009**
	All Others	11.4	28.9	59.6	
	URM Students	25.0	16.7	58.3	.029*
	All Others	11.5	31.1	57.4	
Do you feel your academic department has provided you with the skills and knowledge to write a winning proposal for funding?	URM Women	37.9	51.7	10.3	.020*
	All Others	20.4	47.5	32.1	
	URM Students	33.3	50.0	16.7	.044*
	All Others	19.4	47.9	32.6	
Do you feel that you are ignored by your advisor and others in the lab or given trivial assignments?	URM Women	14.8	11.1	74.1	.023*
	All Others	6.9	34.6	58.5	
	URM Students	11.6	16.3	72.1	.048*
	All Others	7.0	35.7	57.4	
How well do you think your graduate training will or has prepared you for a job in an academic setting?	URM Women	65.5	34.5	0.0	.030*
	All Others	39.2	56.6	4.2	
To what extent has your academic experience in your department reaffirmed your career choice?	URM Women	10.3	75.9	13.8	.001**
	All Others	40.7	42.0	17.3	
	Females	28.6	56.3	15.2	.007**
	Males	47.1	32.9	20.0	
Has your program encouraged interdisciplinary research?	URM Students	64.6	20.8	14.6	.042*
	All Others	44.9	38.8	16.3	
Were you influenced by others to pursue a science and/or engineering degree: mentors?	URM Students	63.8	19.1	17.0	.010*
	All Others	38.0	35.2	26.8	
How confident are you in your ability to complete your degree?	URM Students	64.6	29.2	6.3	.033**
	All Others	52.7	45.9	1.4	
Do you feel singled out in class to speak on behalf of your race/ethnicity?	URM Students	8.3	14.6	77.1	.005*
	All Others	2.0	4.8	93.2	
Is access to lab equipment and instrumentation a barrier to pursuit of your personal research goals?	URM Students	16.7	16.7	66.7	.035*
	All Others	7.8	35.7	56.5	
Do you feel you have been judged negatively based on your gender/gender expression?	Females	7.9	40.4	51.9	.000**
	Males	1.4	4.2	94.9	
Since entering your program, have you experienced the following from members of your department, lab, or program: discrimination on the basis of gender/gender identity/gender expression?	Females	7.9	32.5	59.6	.000**
	Males	1.4	6.9	91.7	

Appendix 1. Responses to The Science and Engineering Graduate Student Experience Survey by Participant Category Comparison Where Significance was Found (cont.)

Question	Category	Very Much	Somewhat	Not at all	*p*
Do you feel singled out in class to speak on behalf of gender/gender identity/gender expression?	Females	4.4	13.2	82.5	.005**
	Males	1.4	1.4	97.2	
Are you encouraged to freely express yourself in class?	Females	38.6	54.4	7.0	.006**
	Males	61.1	37.5	1.4	
In general, are faculty in your department supportive of people from different ethnicities?	Females	70.9	12.4	16.8	.014*
	Males	75.0	1.4	23.6	

Note. The number of respondents in each category is 29 URM Women, 167 All Others; 48 URM Students, 148 All Others; 115 Females, 72 Males.
*$p < .05$. **$p < .001$.