

Climate Report on Gender Issues for Graduate Students at Princeton University

Study designed and conducted by: The Princeton Graduate Women in STEM Leadership Council Joan C. Williams & Rachel Korn (Center for WorkLife Law, Hastings College)

Report by: The Princeton Graduate Women in STEM Leadership Council



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Table of Contents

Foreword	4
Acknowledgements	5
About the Authors	6
Executive Summary	7
Background	8
Study Methodology	10
Materials	10
Data Analysis	14
Sample Characteristics	15
Results	18
Belonging	18
Belonging & Inclusion	18
General Belonging (Princeton, Department, Research Group)	19
Perceived Fraudulence	19
Perceived Fraudulence (Imposter Syndrome)	20
Sexual Objectification & Harassment	20
Interpersonal Sexual Objectification	21
Crossing Physical Boundaries	22
Awareness and Likelihood of Using Princeton Resources	23
Experiencing Bias	25
Prove-it-again/Tightrope	25
Maternal Wall	25
Tug of War	26
Sexism and Related Attitudes	26
Gender-Based Harassment Myth Acceptance	27
Acceptance of Sexual Jokes	27
Denial of Discrimination	28
Reverse Discrimination	29
Work-Family Concerns	29
Work-Family Conflict	30
Mentoring & Sponsorship	31
Mentoring	31

Sponsorship	33
Relationship with Advisor	34
Workplace Process	35
Performance Evaluations	35
Assignments	36
Career Development & Advancement	36
Satisfaction with Graduate School Experience	37
Overall Satisfaction	37
Intent to Leave	37
Career Goal Shifts	37
Discussion & Recommendations	38
Encouraging Results	38
Gender Differences	38
Recommendations	39
Supplement	42
Summary	48
References	50

Foreword

Motivation for the Study

The purpose of this study was to provide a quantitative assessment of gender issues faced by graduate students at Princeton University. Our survey complements and provides quantitative support for a March 2015 survey that solicited personal stories from graduate women in STEM departments at Princeton regarding their experiences within their department climates.

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Our study was designed to collect data to inform policy changes and diversity initiatives at Princeton. The results of this survey can be used to craft the content of Assistant in Instruction and sexual harassment training programs to create more inclusive departmental environments. We hope the information we have gathered will help inform diversity initiatives within departments and throughout Princeton's campus, with the shared goal of creating a university-wide climate that is welcoming and enjoyable for all persons.

The Princeton Graduate Women in STEM Leadership Council

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About the Authors

The Princeton Women in STEM Leadership Council is a group of graduate student and postdoctoral women interested in advocacy and effecting policy changes relating to issues facing women in STEM at Princeton University. Our group was convened by the Graduate School Diversity and Inclusion team and works closely with university administrators to create a more inclusive environment at Princeton. The goal of the council is to tackle problems that may hinder this process or create a non-inclusive environment for graduate women in STEM. At present, we have representatives from the following STEM departments: Physics (Laura Chang), Molecular Biology (Kimberly Box), Geosciences (Clara Blättler), Ecology and Evolutionary Biology (Justine Atkins & Zoe Volenec), Electrical Engineering (YunHui Lin & Alexandra Werth), Psychology (Rachel Connor), and Mathematics (Lena Ji). Past members of the Princeton Women in STEM Leadership Council also contributed to the development of this survey (Genny Plant, Electrical Engineering; Colleen Richardson, Chemistry; Sara Simon, Physics; Angelina Sylvain, Neurosciences).

Executive Summary

This report provides an analysis and evaluation of the current climate on gender issues for graduate students at Princeton University. Data were collected via a quantitative survey from a sample of 332 graduate students (192 females, 136 males, 4 other/nonbinary) in collaboration with Professor Susan Fiske (IRB PI) and colleagues at the Center for WorkLife Law. The survey contained a series of questions covering various aspects of graduate students' experiences at Princeton, and specifically those that relate to issues of gender, sexual harassment, and discrimination. The complete survey is available upon request to <u>rachelac@princeton.edu</u>.

We observed a number of encouraging results; most notably, a lack of gender differences in intentions to leave Princeton, career goal shifts, and overall satisfaction with one's graduate career. However, we also identified concerning differences in the experiences of graduate men and women. We find that, relative to graduate men, graduate women feel lower belonging in their departments and greater perceived fraudulence (imposter syndrome). Graduate women also experience higher incidences of sexual harassment and have lower confidence in the reporting process for such incidences at Princeton. Furthermore, graduate women are more likely than graduate men to encounter doubts about their competence, narrow behavioral expectations, and bias based on family decisions.

In addition to these findings, we find gender differences in sexist attitudes, work-family concerns, and mentoring and sponsorship. For instance, graduate men, relative to graduate women, are more accepting of sexual jokes and gender-based harassment, and they are more likely to perceive and resent reverse discrimination toward men. More than men, women report receiving unsolicited advice about family planning and feeling pressure to return to work soon after having children. Women in male-dominated departments also report receiving lower quality mentoring and less access to networking than men do.

Importantly, many of the gender differences we identify depend on departmental gender composition; that is, in many cases, gender differences are most pronounced or only observed in male-dominated departments.

Based on these findings, we recommend that the university administration take immediate action to improve the climate on gender issues for graduate students. Specific recommendations discussed include:

- an improved reporting process for incidences of sexual harassment
- increasing female mentorship by providing funding for invited-seminars from female faculty at other institutions
- encouraging development of department-level initiatives aimed at increasing diversity and inclusion

Background

Women now constitute over half of all college students, earn more undergraduate degrees than men, and earn more than half of all doctoral degrees (Snyder, de Brey, & Dillow, 2018). Despite progress in these pre-PhD outcomes, gaps in post-PhD career stages remain (Figure 1). Women make up only about 30% of full-time, full professors (Snyder et al., 2018). Representation of women of color in academia has also increased in recent years, but is far behind that of White women; underrepresented minority women (Black, Hispanic, and American Indian women) make up less than 3% of full-time, full professors (Snyder et al., 2018). Representation issues for women in academia are further exacerbated in science, technology, engineering, and mathematics (STEM; Li & Koedel, 2017).





Why are women underrepresented in academia?

A commonly-used metaphor for women's academic underrepresentation (particularly in STEM fields) is the "leaky pipeline": Women "leak" from the academic pipeline at various career stages from high school on through full professorships. Recently, gender gaps in academia have begun to close at sections of the pipeline for some fields (such as undergraduate and graduate degrees awarded in biology; Cheryan, Ziegler, Montoya, & Jiang, 2017), but other gaps remain in place (such as undergraduate and graduate degrees awarded in engineering, physics, and computer science; Cheryan et al., 2017). In the pipeline from graduate school to applying for tenure, women continue to "leak" at each stage from hiring, tenure, promotion, and leadership positions (National Research Council, 2007; Wolfinger, Mason & Goulden 2008). Women are more likely than men to leave the paid labor force after receiving their PhDs (Mason, Wolfinger & Goulden 2013). Fewer women than men end up in the applicant pool for tenure-track positions, and

women are more likely than men to hold adjunct or part-time academic positions (National Research Council, 2007; Mason et al., 2013). Women who do make it on the tenure track are still less likely than men to get tenure (Wolfinger et al., 2008).

Research in STEM suggests that despite initiatives to foster more gender diverse and ethnically diverse departments, women often face departmental cultures that make them feel unwelcome (Columbia University PPC, 2018; Puritty et al., 2017). *Departmental culture* refers to the shared expectations, beliefs, and values that guide behavior of individuals within a department (AAUW, 2010). The cultural climate of departments has previously been identified as a leading barrier to women persisting in STEM career tracts (Dasgupta & Stout, 2014; National Research Council, 2007; Ong, Wright, Espinosa, Orfield, 2011). Women in traditionally male fields often encounter a "chilly climate" within their departments, which includes informal traditions and practices, as well as shared beliefs and assumptions, that "single out, overlook, ignore, or otherwise discount" individuals on the basis of gender (Hall & Sandler, 1986). Such environments subtly communicate negative messages about women's fit and abilities in a field (e.g., via stereotypes, Leslie, Cimpian, Meyer, & Freeland, 2015; Nosek, Banaji, & Greenwald, 2002; Nosek et al., 2009), which undermine women's belonging and self-efficacy (Cheryan et al., 2017; Dasgupta & Stout, 2014; Good, Rattan, & Dweck, 2012; Murphy, Steele, & Gross, 2007), and ultimately, their career advancement and persistence (Good et al., 2012; Hall & Sandler, 1986; Lewis et al., 2017). Evidence suggests that recruiting efforts alone will not fix the leaky pipeline issue; departments must also create environments that foster inclusion for individuals of all backgrounds (Nielsen et al., 2017; Puritty et al., 2017).

Studying climate issues at Princeton is important because of:

Ethics. Gender gaps in status and power are a global reality. Gender inequality props up other inequalities (racial and sexual inequality). If we value equality as an ideal, working toward a more gender-equitable world should be a priority. A more gender-equal world means a better world for all (not just women, but men and children).

Innovation and competitiveness. More diversity in the academy creates more diversity in research, methods, and perspectives (Powell, 2018). Increasing the representation of women from multiple different backgrounds can help move research forward, lead to innovation, and enhance the competitiveness of organizations (Díaz-García et al., 2013; Hunt, Prince, Dixon-Fyle, & Yee, 2018; Miller & del Carmen, 2009; Nielsen et al., 2017).

Study Methodology

We designed our survey in collaboration with Susan Fiske (faculty PI) and our colleagues at the Center for WorkLife Law. Survey questions were informed by our March 2015 survey (Princeton Graduate Women in STEM Leadership Council, 2015), as well as by research on women's underrepresentation in STEM. The survey contains a series of questions covering various aspects of graduate students' experiences at Princeton. Categories covered include: sense of belonging, sexual objectification and harassment, sexism, work-family concerns, mentoring and sponsorship, workplace processes, and satisfaction with graduate school experience.

Descriptions of measures used are included below. In addition, the entire survey is available upon request to <u>rachelac@princeton.edu</u>. This survey was hosted by Qualtrics and supported by Princeton University OIT. The survey was sent out to the entire graduate student body in the Spring of 2018 in two separate sessions and was open for a total of six weeks.

To encourage participation and maximize the survey sample size, participants were entered into a raffle to win Amazon gift cards totalling \$300 or one of the other prizes specified in the survey email (Roku TV, Tile bluetooth, 1TB external hard drive).

Anonymized results were analyzed by members of the Women in STEM Leadership Council at Princeton University and colleagues at the Center for WorkLife Law, University of California, Hastings College of the Law.

In presenting the results of the survey, we have included respondent quotes from our 2015 survey that provide real-world examples of the phenomena described by the data. The 2015 survey solicited personal stories from women in STEM departments at Princeton regarding their experiences within their department climates.

Materials¹

Belonging

Belonging and Inclusion. Belonging and inclusion in one's academic department were assessed with an 8-item measure with good reliability (Cronbach's a = .90). Four items were taken from a measure of exclusion (Center for WorkLife Law, 2018), and four items were developed for this study. Example items: "People in my department accept me"; "I feel welcome in informal gatherings at my workplace."

General Belonging (Princeton, department, research group). General belonging at Princeton University, in one's department, and in one's research group were each assessed with a six-item measure (Center for WorkLife Law, 2018). These measures demonstrated good reliability (University: a = .90;

¹ Except where otherwise noted, items were measured on a 6-point Likert scale (1 = Disagree Strongly; 6 = Agree Strongly). Items within a scale were averaged to create a composite measure for each variable.

Department: a = .90; Research Group: a = .93). Example items: "I can be myself at Princeton/in my department/in my research group"; "I am trusted and respected by colleagues while working at Princeton/in my department/in my research group."

Perceived Fraudulence

Perceived Fraudulence (Imposter Syndrome). Eight items from Kolligian and Sternberg's (1991) Perceived Fraudulence Scale (a = .73) were used to measure perceived fraudulence. Example items: "Even though I feel that I have a lot of potential, I sometimes feel less competent than colleagues"; "I often worry about not succeeding with a project or on an examination, even though others around me have considerable confidence that I will do well."

Sexual Objectification & Harassment

Interpersonal Sexual Objectification. Six items from Kozee, Tylka, Augustus-Horvath, and Denchik's (2007) Interpersonal Sexual Objectification Scale (a = .89) were used to assess experiences of sexual objectification. Items were measured on a 5-point Likert scale (1 = Never; 5 = Almost Always). Example items: "How often have you heard someone make sexual comments or innuendos when noticing your body?"; "How often have you seen someone stare at one or more of your body parts?"

Crossing Physical Boundaries. One item was used to assess experiences of physical boundary violations across several situations (i.e., by your advisor or someone in a position of power, when interacting with members of your research group, at a department event, at a social event involving members of your field). Item: "Since being at Princeton, has anyone crossed your physical boundaries in a way that made you feel uncomfortable? (It could be as minor as a hand on your shoulder or a pat on the head.)"

Awareness and Likelihood of Using Princeton Resources. Three items assessed participants' awareness of and likelihood of using Princeton resources for coping with harassment and discrimination. As items assessed different aspects of using Princeton resources, items were examined individually. Items: "I know someone who is available to help me if I experience harassment or discrimination of any kind at Princeton"; "I believe requesting help at Princeton would actually help me if me experienced harassment or discrimination"; "I would avoid reporting harassment or discrimination to Princeton out of fear that I would experience negative consequences for my career."

Experiencing Bias

The four patterns bias scale, developed based on a comprehensive review of psychological literature on bias by the Center for Worklife Law (2018), has been used in previous research on women's underrepresentation in STEM (Williams, 2014). This measure assesses bias based on race as well as gender, and it consists of four subscales (Prove-it-again, Tightrope, Tug of War, and Maternal Wall). Because the present study used a modified version of this measure, we conducted an exploratory factor analysis on all of the items. Principal axis factoring (PAF) analyses with promax rotation suggested the presence of seven factors that accounted for 61.8% of the total variance. We dropped one Prove-it-again item, one Tightrope item, three Tug of War items, and two Maternal Wall items, because they had low factor loadings, cross-loaded, or did not load as expected (e.g., loaded alone on a separate factor). The majority of the remaining Prove-it-again and Tightrope items loaded together, so we made the decision to combine these items. A factor analysis requesting a three-factor solution on the remaining items accounted for 54.2% of the variance.

Prove-it-again/Tightrope. Thirteen items measured Prove-it-again and Tightrope bias (a = .92). Prove-It-Again bias occurs when some groups (e.g., women, people of color) are required to provide more evidence of competence in order to get the same level of recognition as others (Williams, 2014). Tightrope bias refers to the double bind some groups face in navigating competing sets of expectations. For example, the double bind for women is that they must calibrate their behavior so as to avoid being seen as too feminine, in which case they are liked but disrespected, and they also must avoid being seen as too masculine, in which case they are respected but disliked (Connor & Fiske, 2017; Williams, 2014). Example items: "I have to prove myself over and over again to get the same level of recognition as my colleagues"; "There is a narrow range of acceptable behaviors for me at work."

Maternal Wall. Four items measured Maternal Wall bias (a = .62). Maternal Wall bias involves perceptions of women as less competent and committed to their jobs when they become mothers (Williams, 2014). Example item: "People with caregiving responsibilities are seen as not committed to their careers."

Tug of War. Three items assessed Tug of War bias (a = .73). Tug of War bias refers to conflict among women and people of color that results from bias against women and people of color (Williams, 2014). Example items: "Women end up in conflicts because of different choices they make about how to fit in to a majority male workplace"; "Women and people of color are in competition with each other for career-enhancing opportunities."

Sexism and Related Attitudes

Gender-Based Harassment Myth Acceptance. Seven items adapted from the Illinois Sexual Harassment Myth Acceptance Scale (Payne, Lonsway, & Fitzgerald, 1999) measured tolerance of gender-based harassment (a = .74). Gender-based harassment was defined as "unwelcome verbal, nonverbal, or physical conduct directed at a person based on gender, that has the effect of interfering with an individual's educational experience, working conditions, or living conditions by creating an intimidating, hostile, or offensive environment." Example items: "People who claim that they have been harassed based on their gender are usually exaggerating"; "A person can usually stop gender-based harassment by simply telling the offender that their behavior is not appreciated."

Sexual Jokes. Four items from the Moral Disengagement in Sexual Harassment Scale (Page, Pina, Giner-Sorolla, 2016) evaluated the minimization of sexual harassment in the form of sexual jokes (a = .86). Example item: "Women should lighten up a little bit and not get too uptight about sexual jokes at work."

Denial of Discrimination. Four items adapted from the Modern Sexism Scale (Swim, Aikin, Hall, & Hunter, 1995) measured denial of discrimination toward women in academia (a = .80). Example item: "Discrimination against women in academics is no longer a problem."

Reverse Discrimination. Six items were taken from Feather and Boeckmann (2007) and adapted to focus on perceptions and resentment of preferential treatment of women in academics (a = .90). Example items: "These days women academics have an unfair advantage over men academics in securing positions"; "It makes me angry when women academics are hired over men academics who are just as well qualified."

Work-Family Concerns

Work-Family Conflict. Four items examined experiences of conflict between work and family demands. Items asked about the importance of personal relationships in shaping career decisions, the frequency with which work-related meetings are scheduled outside standard work hours, unsolicited advice about family planning, and pressure to return to work after having a child. These items were examined individually.

Mentoring and Sponsorship

Sponsorship. Quality of mentoring and access to networking was measured using six items from the Center for WorkLife Law's Workplace Experiences Survey (2018). Example items: "My advisor is responsive to my requests for mentoring"; " I have had as much access to formal or informal networking opportunities as my colleagues."

Relationship with Advisor. Five individual items asked about participants' relationships with their advisors. Example items: "I feel comfortable going to my primary advisor with negative results"; "My relationship with my primary advisor is extremely important for my future career development."

Workplace Processes

Performance Evaluations. Three items asked about participants' perceptions of performance feedback as fair (a = .68). Example item: "The feedback on my performance has been fair."

Assignments. Three items asked about participants' access to desirable work assignments (a = .72). Example item: "I have had the same access to desirable projects as my colleagues."

Career Development and Advancement. Nine items asked about participants' opportunities for career development and advancement (a = .79). Example items: "I have been encouraged to pursue opportunities that would advance my future career"; "I have been given the authorship I deserve for my work."

Satisfaction with Graduate School Experience

Overall Satisfaction. All satisfaction items were taken from the UC Doctoral Student Career Life Survey (Mason & Goulden, 2006). Participants were asked overall, how satisfied they were with 11 different aspects of graduate student life. Items were measured on a four-point scale (1 = Not at all Satisfied; 4 = Very Satisfied) and examined individually.

Intent to Leave. Four items measured participants' intentions to leave Princeton (Center for WorkLife Law, 2018). Example item: "I have considered leaving Princeton before completing my degree or program."

Career Goal Shifts. To assess participant downshifts in career goals (from research-intensive positions to less research-focused or adjunct positions), three items assessed participants' career goals upon entering graduate school and at their current stage (Collett, Avelis, & Lizardo, 2016; Mason & Goulden, 2006).

Data Analysis

Missing Data

For most variables, less than 4% of data were missing. Eight and two percent of cases were missing on the faculty and student gender composition variables, respectively. Due to the difficulty in classifying department faculty for some departments (e.g., interdisciplinary areas), missing data on faculty gender composition were unobtainable. Similarly, information on student gender composition were unobtainable for one department (Finance). Thus, analyses including these variables were only performed on cases for which data were available.

To impute the remaining missing data, we used multiple imputation (*m* = 20), implemented with the mice (van Buuren & Groothuis-Oudshoorn, 2011) and miceadds R packages (Robitzsch, Grund, & Henke, 2016).

Analyses

Multiple regression analyses were conducted for each outcome variable collected on a continuous scale. Variables included in regression analyses are listed in Table 1. Other statistical approaches (e.g., binary logistic regression, chi-square analyses, independent *t*-tests) were also used when appropriate (i.e., with binary or categorical outcomes; when sample sizes were small). The mice (van Buuren & Groothuis-Oudshoorn, 2011) and bucky (Tahk, 2017) R packages were used to return averaged estimates across the multiply imputed datasets. Where significant interactions with continuous moderators were found, regions of significance analyses were conducted to identify the range of values (of the continuous moderator) at which groups differed significantly (Preacher, Curran, & Bauer, 2018)

Table 1
List of Variables Included in Regression Models
Gender (men = 0; women = 1)
Race/ethnicity (White = 0; Person of Color = 1)
Nationality (US = 0; non-US = 1)
Sexual Orientation (heterosexual = 0; LGBQA = 1)
Parent education (not first generation student = 0; first generation student = 1)
Advisor gender (same-gender advisor = 0; other-gender advisor = 1)*
Years in graduate school ($M = 2.79$, centered)
Percent of female students in department ($M = 38.31$, centered)
Interactions: Gender x Race; Gender x Nationality; Gender x Years; Gender x
Percent Female; Gender x Advisor gender*

Note: * = only included in analyses of variables related to advising (e.g., sponsorship)

Note on Confidentiality

Out of respect for participant confidentiality, and in conjunction with our agreement with the Princeton Office of Institutional Research, we cannot identify individual departments in our

reporting of the data, nor can we share the raw data. Sharing such information could compromise the privacy of individuals participating in our survey.

Results for Other Groups

Although our main report focuses on departmental climate for women, we recognize that other historically disadvantaged groups (e.g., ethnic minority men, sexual minorities, first-generation college students) face similar inclusion issues. Thus, we report results for these groups in the supplement. In addition, we collected data on experiences of racial bias, which we also report in the supplement.

Sample Characteristics

In the following section, we provide a summary of the survey respondents by demographic, cohort, and departmental composition. In total, we had 332 participants² (41% male-identifying; 57.8% female-identifying; 1.2% other/nonbinary³). Of these participants:

- 3.3% have children
- 13.8% are first-generation college students
- 40.3% are single; 28% in a committed relationship (married, domestic partnership, cohabitating); 32.6% in a relationship or dating
- 85.8% are straight; 14.2% are LGBQA / other

Graduate student cohort

Survey participants included roughly equal numbers across multiple years, allowing us to assess changes in climate during cohorts of a student's experience at Princeton.



Figure 2. Reported graduate student cohort of survey respondents.

²Sample after removing participants who were not graduate students (*n*=3) or who missed attention check questions (*n*=18).

³ In this report, we refer to male-identifying individuals as "men" and female-identifying individuals as "women." Gender non-binary persons were not included in results due to small sample size.

Nationality



Figure 3. Reported nationality of survey respondents.

Race & Ethnicity



Figure 4. Reported race/ethnicity of survey respondents.

Department Representation⁴



Figure 5. Proportion of graduate students from each academic department that participated in the survey.

⁴Proportions are approximate, calculated based on 2016-2017 enrollment [retrieved from <u>https://gradschool.princeton.edu/sites/gradschool/files/OpenEnroll1617.pdf</u>]

Results

Belonging

Belonging is "the subjective feeling of fitting in and being included as a valued and legitimate member in a particular setting" (Lewis et al. 2017). Social isolation (lack of belonging) has adverse effects on academic outcomes. Social isolation undermines academic self-efficacy and persistence (Freeman, Anderman, & Jensen, 2007; Hausmann, Schofield, & Woods, 2007; Lewis et al., 2017), and impairs cognitive performance (Baumeister, Twenge, & Nuss, 2002). A sense of belonging has consistently mattered to women's and minorities' participation in STEM (e.g., Cheryan et al., 2017; Dasgupta & Stout, 2014; National Research Council, 2007).

Responses from March 2015 Princeton climate survey:

On occasion, my adviser spontaneously takes male students individually out for drinks to talk about research and other things. He mentioned that it would be inappropriate for him to invite me for drinks, but he didn't offer another avenue for me to receive the same kind of advisement. (Female respondent)

When I came to Princeton about 5 years ago, the basement restroom labels said "Men" (plural) and "Woman" (singular). I'm not sure why they would do that, but it was an early reminder that I was a minority here. (Female respondent)

Belonging & Inclusion

(example item: "I feel welcome in informal gatherings at my workplace")

Women report lower belonging and inclusion in their departments than men, but only in male-dominated departments (difference is significant at 38% female and below).



Percent of Female Graduate Students

Figure 6. Belonging & Inclusion as a function of gender and departments' graduate student gender composition (error bars represent ± 1 SE). When a department's percent of female graduate students is 1 standard deviation below the mean, women's belonging and inclusion is significantly lower than men's (p < .01). Men's belonging and inclusion is negatively related to the proportion of the department's graduate students that are female (p < 0.05).

General Belonging (Princeton, Department, Research Group)

(example item: "I can be myself at Princeton/in my department/in my research group")

Graduate women and men report no differences in general belonging at Princeton University (M_{women} = 4.57; M_{men} = 4.71) or in their research groups (M_{women} = 5.01; M_{men} = 5.26). However, they report a lower sense of belonging in their departments (p < .05).



Figure 7. Average belonging in department (± 1 SE) by gender. Women report a lower sense of belonging in their departments (p < 0.05).

Perceived Fraudulence

Perceived fraudulence, also known as imposter syndrome, is characterized by feelings of intellectual phoniness, and a tendency to discount one's successes and to attribute them to luck or happenstance rather than ability (Clance & Imes, 1978). It involves continuous effort to perform well and anxiety that others will discover one's incompetence (Kolligian & Sternberg, 1991). The continuous management of appearances can lead to emotional exhaustion (Hutchins, Penney, & Sublett, 2018). Perceived fraudulence is also linked to low self-efficacy, academic self-esteem, career satisfaction, and other negative psychological outcomes (Clance & Imes, 1978; Hutchins et al., 2018; Vergauwe, Wille, Feys, De Fruyt, & Anseel, 2015). Although perceived fraudulence is experienced by both men and women, imposter feelings may be more consequential for women's academic outcomes, particularly in fields in which women are expected to be less competent than men (e.g., male-dominated fields; Correll, 2004; Collette, Avelis, & Lizardo, 2016; Sekaquaptewa, 2011).

Responses from March 2015 Princeton climate survey: *A woman student suggests something, and a male student Y says it again right after her. People congratulate Y on the great idea. (Multiple female respondents)*

Women are just not as good as men at quantitative science, but they are better at people-oriented fields. (Female respondent)

Perceived Fraudulence (Imposter Syndrome)⁵

(example item: "Even though I feel that I have a lot of potential, I sometimes feel less competent than colleagues")

For both men and women, perceived fraudulence is positively related to the proportion of other-gender students. As the proportion of female students increases, women's perceived fraudulence decreases (p < .05). Men's perceived fraudulence increases marginally as the percent of female students increases (p = .07). Graduate women report greater perceived fraudulence than men in departments with predominantly male students (p = .07; difference becomes significant at 21% female and lower). Men also report greater perceived fraudulence than women in departments with predominantly female students (difference significant at 66% and higher). However, only a total of eight departments fall at either extreme.



Figure 8. Perceived fraudulence by gender and department graduate student gender composition (error bars represent \pm 1 SE). When a department's percent of female graduate students is 1 standard deviation below the mean, women's perceived fraudulence is marginally higher than men's (p = 0.07). This difference becomes significant when females make up 21% or less of the department's graduate student population (p < 0.05). Women's perceived fraudulence is negatively related to the proportion of female graduate students (p < 0.05).

Sexual Objectification & Harassment

Sexual objectification involves viewing a woman primarily in terms of her body or body parts without respect to her full personhood (Fredrickson & Roberts, 1997). Sexual harassment is unwanted verbal or physical behavior, that "includes unwelcome sexual advances, requests for sexual favors, and other verbal, nonverbal, or physical conduct of a sexual nature" (US Department of Education, 2001). Experiences of sexual harassment decrease academic satisfaction, increase psychological distress, and ultimately, lead to academic disengagement and poorer academic performance (Cortina & Berdahl, 2008; Huerta, Cortina, Pang, Torges, & Magley, 2006; Willness, Steel, & Lee, 2007). Although men can experience sexual objectification and harassment, women are the most frequent targets (Cortina & Berdahl, 2008; Fredrickson & Roberts, 1997; Huerta et al., 2006). For example, according to Princeton University's 2017 We

⁵ Results are similar when analyses are conducted with the percent of department faculty who are female rather than the percent of graduate students who are female.

Speak survey, 16% of graduate women versus 5% of graduate men experienced inappropriate sexual behavior in the 2016-2017 school year. Further, sexual harassment of women is exacerbated in male-dominated fields (Berdahl, 2007).

Responses from March 2015 Princeton climate survey:

I normally dress casually at work, just like all of my male colleagues jeans and a t-shirt. One day I had a professional event after work so I wore a skirt and nice shoes to the office. One coworker did a double take and said, "Woah! Got a hot date?" Another commented, "Oh, now you look like an actual girl." This made me extremely uncomfortable and self conscious. I have stopped dressing up so that I won't receive such comments. (Female respondent)

At a recent prospective week social event, several professors and grad students in my department were discussing the attractiveness of female prospective students and even ranking them or giving them ratings from one to ten. One person said, "This batch is slim pickings compared with last year." Then someone else replied: "I don't know, I think that one is hot. She's a solid 8." (Female respondent)

Interpersonal Sexual Objectification⁶

(example item: "How often have you heard someone make sexual comments or innuendos when noticing your body?")

Overall, reports of sexual objectification were very low. However, graduate women report more frequently experiencing sexual objectification in their departments than graduate men. This finding is most pronounced in male-dominated departments (at -1 SD, difference significant at p < .001; at +1 SD, difference significant at p < .01). As the percent of female students in a department increases, women experience less sexual objectification (p < .05). The percent of female students in a department was unrelated to men's experiences of sexual objectification.



Percent of Female Graduate Students

Figure 9. Sexual objectification as a function of gender and departments' graduate student gender composition (error bars represent ± 1 SE). Female experiences of sexual objectification are significantly higher than male experiences regardless of department graduate student gender composition, but this difference is larger with fewer female graduate students in the department. This difference becomes significant when females make up 21% or less of the department's graduate student population (p < 0.05). Female sexual objectification is positively related to the proportion of the department's graduate students that are male (p < 0.05).

⁶ Results are similar when analyses are conducted with the percent of department faculty who are female rather than the percent of graduate students who are female.

Crossing Physical Boundaries

(example item: "Since being at Princeton, has anyone crossed your physical boundaries in a way that made you feel uncomfortable?")

Responses from March 2015 Princeton climate survey:

While I was walking to the lab with a male colleague, he placed a hand on the small of my back to guide me. (Female respondent)

Several women have reported having behinds grabbed or slapped, or other inappropriate touching. (Multiple female respondents)

Graduate women are more likely than graduate men to report encountering someone who crossed their physical boundaries: when interacting with members of their research group (χ^2 (1, N = 327) = 6.46, p < .05), at a department event (χ^2 (1, N = 328) = 13.98, p < .001), and at a social event involving members of their field (χ^2 (1, N = 328) = 16.70, p < .001). However, graduate women were equally as likely as men to report this occurring with an advisor or someone in a position of power.

A. Interacting with research group



B. At a department event



C. At social event with members of your field





Figure 10. Raw percents of graduate students by gender who reported having their physical boundaries crossed in A their research group, B at a department event, C at a social event, and D by their advisor or another figure in a position of power. Women were more likely to report having their physical boundaries crossed in their research group, at a department event, and at a social event (p < 0.05).

Awareness and Likelihood of Using Princeton Resources⁷

Responses from March 2015 Princeton climate survey:

Some do not believe students when they report harassment or personal difficulties/conflicts. This creates a fear of confiding in people and reporting. (Multiple female respondents)

When women students report harassment to others, it is often dismissed as something that is normal and happens all the time and told that they should just ignore it. (Multiple female respondents)

Graduate women in male-dominated departments are less likely than graduate men to agree that they know someone at Princeton who can help if they experience harassment or discrimination (p < .05; difference significant at 25% and lower). As the percent of female graduate students increases, women are more likely to agree with this statement (p = .05).



Percent of Female Graduate Students

Figure 11. Reports that someone is available at Princeton to help with cases of harassment or discrimination as a function of gender and departments' graduate student gender composition (error bars represent \pm 1 SE). When a department's percent of female graduate students drops to 1 standard deviation below the university mean, females are significantly less likely to agree that they know someone at Princeton who can help (p < 0.05). Female reports of knowing someone at Princeton who can help are positively related to the proportion of the department's graduate students that are female (p < 0.05).

Graduate women are also less likely than men to believe that requesting help at Princeton would actually help them if they experience harassment or discrimination, particularly in male-dominated departments (p < .001, difference significant at 53% and lower).

⁷ Results are similar when analyses are conducted with the percent of department faculty who are female rather than the percent of graduate students who are female.

Requesting help at Princeton would actually help



Figure 12. Reports that requesting help at Princeton would actually help a student as a function of gender and departments' graduate student gender composition (error bars represent ± 1 SE). When a department's percent of female graduate students is about one-half (53%), females are significantly less likely to agree that requesting help at Princeton would actually help them if they experience harassment or discrimination (p <0.001).

Graduate women, relative to graduate men, are also more likely to agree that they would avoid reporting harassment or discrimination to Princeton out of fear they they would experience consequences for their careers, particularly in male-dominated departments (p < .001, difference significant at 54% and lower). As the percent of female graduate students increases, men are more likely to report that they would avoid reporting harassment or discrimination (p < .05).



Figure 13. Reports that students would avoid reporting harassment or discrimination to Princeton as a function of gender and departments' graduate student gender composition (± 1 SE). When a department's percent of female graduate students is about one-half (54%), females are significantly more likely to report that they would avoid reporting incidences (p <0.05).

Experiencing Bias

As members of low-status groups, women and People of Color encounter similar patterns of bias in the workplace. For instance, women and People of Color face doubts about their competence, and they often need to "provide more evidence of competence then their peers in order to be seen as equally as competent" (Prove-it-again; Williams, Korn, Rincon, & Finn, 2018, see also Biernat & Kobrynowicz, 1997; Moss-Racusin et al., 2012; Steele & Aronson, 1995). Further, women and People of Color face negative reactions when they do not behave in line with stereotypic expectations (Tightrope; Heilman, Wallen, Fuchs, & Tamkins, 2004; Rudman, Moss-Racusin, Glick, & Phelan, 2012). Being a target of bias in the workplace is associated with poorer workplace outcomes. For instance, Prove-it-again, Tightrope, Maternal Wall, and Tug of War bias predict lower feelings of belonging and inclusion at work (Williams et al., 2018). Further, Prove-it-again, Tightrope, and Tug of War bias negatively predict career satisfaction and intent to remain in one's current job (Williams et al., 2018).

Prove-it-again/Tightrope⁸

(example items: "I have to prove myself over and over again to get the same level of recognition as my colleagues"; "There is a narrow range of acceptable behaviors for me at work.")

Graduate women report experiencing Prove-it-again/Tightrope bias more than graduate men do, particularly in male-dominated departments (p < .001). As the percent of female graduate students increases, men report experiencing more of this bias (p < .01).



Figure 14. Prove-it-again/Tightrope bias by gender and departments' graduate student gender composition (± 1 SE). Women experience this bias more than men, regardless of departmental gender composition (p's < .01). Men's experiences of this bias are positively related to the proportion of the department's graduate students that are female (p < 0.05).

Maternal Wall

(example item: "People with caregiving responsibilities are seen as not committed to their careers.")

⁸ Results are similar when analyses are conducted with the percent of department faculty who are female rather than the percent of graduate students who are female.

Women, relative to men, report experiencing more Maternal Wall bias (p < .01).



Figure 15. Average Maternal Wall bias by gender (error bars represent ± 1 *SE). Difference is significant at p* < 0.01.

Tug of War

(example item: "Women end up in conflicts because of different choices they make about how to fit in to a majority male workplace.")

Graduate men and women do not significantly differ in their experiences of Tug of War bias ($M_{women} = 2.75; M_{men} = 2.46$).

Sexism and Related Attitudes

Sexism refers to "individuals' attitudes, beliefs, behaviors, and organizational, institutional, and cultural practices that either reflect negative evaluations evaluations of individuals based on their gender or support unequal status of women and men" (Swim & Hyers, 2009). Like sexual objectification and harassment, sexism creates an unwelcoming environment for women in the workplace (Settles, Cortina, Malley, & Stewart, 2006). Sexist attitudes typically prescribe stereotypes to women on the basis of their gender, such as the idea that women are more suited to nurturing roles (Barreto, Ellemers, Piebinga & Moya, 2010). Sexism contributes to gender discrimination in hiring and promotion (Feather & Boeckmann, 2007; Masser & Abrams, 2004), undermines women's performance (Dardenne, Dumont & Bollier, 2007), and discourages women from pursuing high-status positions (Rudman & Heppen, 2003).

Responses from March 2015 Princeton climate survey:

I asked my colleague to stop calling women "girls," and now when we talk he emphasizes the word "women" and says to colleagues, "We wouldn't want to offend [my name]." (Female respondent)

While arguing about a scientific problem, one of my colleagues said, "You're letting your emotions get the best of you. I guess women are just more emotional." (Female respondent)

I am always given the responsibility of cleaning the lab because "girls are just better at it." (Female respondent)

Gender-Based Harassment Myth Acceptance

(example item: "People who claim that they have been harassed based on their gender are usually exaggerating")

Responses from March 2015 Princeton climate survey:

Justifying discriminatory or harassing behavior with statements like "He's just charming" and "That's just the way he is." (Multiple female respondents)

When telling perpetrators to stop or telling others about harassment, women are often told that they are overreacting with statements like, "You're overreacting," "Give them a break they were joking," and "That happens all the time you'll get used to it." (Multiple female respondents)

Both graduate men and women report low acceptance of gender-based harassment myths. However, graduate men report greater acceptance of gender-based harassment myths than graduate women (p < .05).



Figure 16. Gender based harassment myth acceptance (± 1 SE) by gender. Graduate men report significantly greater GBH myth acceptance (p <0.05).

Acceptance of Sexual Jokes

(example item: "Women should lighten up a little bit and not get too uptight about sexual jokes at work.")

Responses from March 2015 Princeton climate survey:

There is a common acceptance of rape jokes and the casual use of the word "rape" (e.g. "That exam raped me"). (Multiple female respondents)

Graduate men and women report low acceptance of sexual jokes in the workplace. However, graduate men report greater acceptance of sexual jokes than graduate women (p < .05).



Figure 17. Acceptance of sexual jokes (± 1 SE) by gender. Graduate men report significantly greater acceptance of sexual jokes (p <0.05).

Denial of Discrimination

(example item: "Discrimination against women in academics is no longer a problem")

Responses from March 2015 Princeton climate survey:

A colleague insisted that there was no gender bias in science because of a study he'd read. I pointed out that it was thoroughly debunked, but he insisted that that still didn't prove that there was still bias. (Female respondent)

I was discussing bias with my female professor, and she said, "It's not like it was when I was starting out. That stuff just doesn't happen anymore." (Female respondent)

Graduate women and men did not differ in denial of discrimination ($M_{women} = 1.94$; $M_{men} = 2.08$).



Figure 18. Denial of existing issues of discrimination (± 1 SE) by gender. Graduate men and women reported similar responses regarding denial of discrimination.

Reverse Discrimination

(example items: "Men academics are unfairly disadvantaged in getting positions when compared to women academics"; "It makes me angry when women academics are hired over men academics who are just as well qualified")

Responses from March 2015 Princeton climate survey:

Many women reported hearing statements like, "You'll have no trouble landing a professorship since you're a woman." (Multiple female respondents)

Many women also reported hearing men complain about the difficulty they anticipated facing on the academic job market, saying things like, "I'm screwed for finding a job because I'm a white guy." (Multiple female respondents)

Graduate men are more likely to perceive and report resentment of reverse discrimination relative to graduate women (p < .05).



Figure 19. Perceptions of reverse discrimination (± 1 SE) by gender. Men perceive reverse discrimination more than women do (p < 0.05).

Work-Family Concerns⁹

Work-family concerns are consistently cited as one of main reasons women leave academia (Mason et al., 2013; National Research Council, 2007; Williams & Ceci, 2012). In "*Do Babies Matter? Gender and Family in the Ivory Tower,*" Mason and colleagues (2013) collated results from surveys and original research that collectively followed tens of thousands of graduate students throughout their careers. They found that the decision to have a family dramatically impacts women's career trajectories. Female graduate students or postdocs who have children

⁹ The survey also included questions for graduate students with children. However, because very few participants fell into this category (~ 3% of the sample), we do not report results for these questions.

are more than twice as likely to leave academia as comparable men with children or comparable women without children. Furthermore, women who choose to stay in academia pay a significant cost, often working in lower-paid part-time and adjunct faculty positions (Mason et al., 2013). Work-family conflict has significant psychological costs; it is linked to increased depression, anxiety, substance abuse, impaired family functioning, marital conflict, stress, and poorer overall quality of life for employees (Hardy et al., 2016). In academia, this can lead to mounting pressure on top of already taxing workloads (O'Meara & Campbell 2011; Wolfinger et al., 2008), leading to declines in career satisfaction, productivity and retention (Eby et al., 2005).

Responses from March 2015 Princeton climate survey:

I often get unsolicited advice from my advisor about family issues, but I don't even plan on having kids. (Female Respondent)

"You should wait until after this project is done/ after you graduate/ after you've secured a tenure track position to have kids." (Female Respondent)

Work-Family Conflict

(example item: "Someone more senior in my department has given me unsolicited advice about family planning")

Men and women are equally likely to agree that personal relationships are important in shaping their career decisions ($M_{women} = 4.77$; $M_{men} = 4.46$). Further, both men and women disagree that work-related meetings are often scheduled outside of standard work hours ($M_{women} = 2.60$; $M_{men} = 2.41$). However, women are more likely than men to agree that they have received unsolicited advice about family planning from someone more senior in their department (p < .001).



Figure 20. Reports on receiving unsolicited family planning advice (± 1 SE) by gender. Women are significantly more likely to receive this advice from someone more senior in their department (p < 0.001).

Women, relative to men, also report that they would feel greater pressure to return to work before they wanted to if they had a child. However, this difference is only significant in male-dominated departments (p < .05, difference significant at 33% and below). As the percent of

female students increases, the more men report that they would feel pressured to return to work after having a child (p < .01).¹⁰



Figure 21. Reports of pressure to return to work before ready after having a child by gender and departmental gender composition (± 1 SE). When women make up 1/3 of students (33%), women are more likely to report that they would feel pressure to return to work prematurely (p < 0.05). Men report feeling this pressure more as the percent of female graduate students increases (p < 0.01).

Mentoring & Sponsorship

Mentoring can be broadly defined as a relationship in which a more experienced individual (mentor) provides advice and assistance to a less experienced individual (mentee) (Meschitti & Smith, 2017). Mentoring in academic organizations benefits the mentor, mentee, and organization (Tenenbaum, Crosby & Gliner 2001). Women and other minorities depend more on support offered by mentoring (Meschitti & Smith, 2017). The absence of mentoring (or of effective mentoring) has contributed to the "glass ceiling" faced by women and other minorities (Duck 1997). Mentoring benefits women in academia by increasing publication rates, employment opportunities, and confidence (Duck 1997).

Mentoring

Male advisors are significantly more likely than female ones (χ^2 (1, *N* = 331) = 47.23, *p* < .001).



Figure 22. Regardless of gender, graduate students are more likely to have a male advisor (p <0.001).

The majority of students report that they refer to their primary advisor by their first names.

¹⁰ Results are similar when analyses are conducted with the percent of department faculty who are female rather than the percent of graduate students who are female.



Figure 23. Regardless of gender, graduate students are more likely to refer to their primary advisor by their first name rather than a professional title.

The majority of students also report feeling most comfortable going to a fellow graduate student when having an issue with their primary advisor.

If I'm having an issue with my primary advisor, I



Student Admin Grad Princeton Studies

Figure 24. Graduate students, regardless of gender, feel most comfortable talking to their peers regarding issues with their primary advisor.

Students report that they receive more regular feedback from their advisors than from their departments (M = 4.13; M = 3.40). Women and men do not differ in the amount of feedback they get from their advisors or departments (p > .54).



I get regular feedback on my performance from my advisor.

I get regular feedback on my performance from my department.

Figure 25. Graduate students, regardless of gender, report receiving more regular feedback from advisors than from departments.

Sponsorship

(example item: "My advisor is responsive to my requests for mentoring")

In male-dominated departments, men report receiving more sponsorship than women do (p < .05, significant at 33% and lower). As the percent of female students increases, men's reports of sponsorship decline (p < .01), converging with women's.¹¹



Percent of Female Graduate Students

Figure 26. Sponsorship as a function of gender and departments' graduate student gender composition (\pm 1 SE). When a department's percent of female graduate students drops to one third (33%), women receive significantly less sponsorship than men (p <0.05). Men report receiving declines in sponsorship with increasing percent of female graduate students in the department (p <0.01).

Women, but not men, report more sponsorship from same-gender, relative to other-gender, advisors (p < .05). Women, relative to men, also report receiving marginally less sponsorship from other-gender advisors (p = .07).

¹¹ Results are similar when analyses are conducted with the percent of department faculty who are female rather than the percent of graduate students who are female.



Figure 27. Women report significantly more sponsorship from same-gender than other-gender advisors (p < 0.05) and actually report receiving marginally less sponsorship from other-gender advisors than men (p < 0.07).

Relationship with Advisor¹²

(example item: "I feel comfortable going to my primary advisor with negative results")

Men and women both express that maintaining a good relationship with their advisors is important to obtain good recommendation letters (M_{women} = 5.24; M_{men} = 4.97). Further, both men and women agree that their advisors support their professional development (M_{women} = 5.15; M_{men} = 5.13). However, in male-dominated departments, women report feeling less comfortable going to their primary advisors with negative results than men do (p < .05, difference significant at 31% and lower). Men feel less comfortable reporting negative results to their advisors as the percent of female students increases (p < .05).



Figure 28. Comfortability going to advisor with negative results by gender and department gender composition (\pm 1 SE). When a department's percent of female graduate students drops to less than one third (31%), women feel less comfortable presenting negative results than men do (p <0.05). Comfort of graduate men with reporting negative results to their advisor declines with increasing percent of female graduate students in the department (p < 0.05).

¹² Results are similar when analyses are conducted with the percent of department faculty who are female rather than the percent of graduate students who are female.

In female-dominated departments, women, more than men, agree that their relationships with their advisors are important for future career development (p < .05, difference significant at 54% and higher). In female-dominated fields, relative to male-dominated ones, men report that relationships with their advisors are less important for future career development (p = .05).



Figure 30. Importance placed in relationship with advisor for future career development as a function of gender and departments' graduate student gender composition (\pm 1 SE). When a department's percent of female graduate students is higher than roughly one half (54%), women place more importance in their relationship with their advisor for career development than men (p <0.05). Men place less importance in their relationship with their advisor regarding career development with increasing percent of female graduate students in the department (p = 0.05).

Workplace Process

Workplace process measures assess participants' perceptions of fair treatment at work, with respect to performance evaluations, access to desirable assignments, and opportunities for career development. Research supports that women and people of color face biases in evaluations, access to assignments, and work opportunities (Biernat & Kobrynowicz, 1997; Heilman et al., 2004; National Research Council, 2007; Williams, Li, Rincon, & Finn, 2016). Perceptions of fair treatment in one's workplace are important to job satisfaction and commitment, as well as job performance (Colquitt, Conlon, Wesson, Porter, & Ng, 2001).

Performance Evaluations

(example item: "The feedback on my performance has been fair.")

Students who report receiving regular feedback on their performance generally feel that the feedback is fair. However, Men of Color, relative to White men, view feedback on their performance as marginally less fair (p = .07). Similarly, White women, relative to White men, view feedback on their performance as marginally less fair (p = .06).



Figure 31. Fairness of performance evaluations as a function of gender and race (± 1 SE). White men view feedback on their performance as marginally more fair, compared to Men of Color (p = .07) and White women (p = .06).

Assignments

(example item: "I have had the same access to desirable projects as my colleagues")

Women and men report similar access to desirable assignments (difference becomes significant at 12% and lower, however few departments fall into this range). For men, this variable is negatively related to the percent of female students (p < .05).



Percent of Female Graduate Students

Figure 32. Access to desirable assignments by gender and department gender composition (± 1 SE). Slope for men is significant at p < .05.

Career Development & Advancement

(example item: "I have been encouraged to pursue opportunities that would advance my future career")

Women and men do not differ in the career development and advancement opportunities that they have been encouraged to pursue ($M_{women} = 4.58$; $M_{men} = 4.76$).

Satisfaction with Graduate School Experience

Overall Satisfaction

(example item: How satisfied are you with each of the following? "Quality of your degree program")

Women and men report similar levels of satisfaction with the quality of their degree programs, interactions with doctoral students, faculty, and primary advisors, personal progress toward graduate degrees and career goals, departmental support for career-life balance, time for self, family situation with partner and children, and overall career and life situation (see Table 2).

Table 2		
Overall Satisfaction		
How satisfied are you with each of the following?	Mean - Women	Mean - Men
Quality of degree program	3.58	3.72
Interaction with faculty	3.41	3.46
Interaction with primary advisor	3.39	3.35
Interaction with fellow doctoral students*	3.49	3.67
Personal progress toward doctoral/graduate degree	3.40	3.21
Personal progress toward career goals	3.36	3.20
Departmental/unit support for career-life balance	2.90	3.11
Time for self (e.g., recreation, relaxation, health)	2.89	2.86
Family situation with spouse/partner (if any)	3.42	3.26
Family situation with children (if any)	3.20	3.08
Overall career and life situation	3.25	3.33

Intent to Leave

(example item: "I have considered leaving Princeton before completing my degree or program")

Women and men report similarly low intentions to leave Princeton ($M_{women} = 2.16$; $M_{men} = 2.11$).

Career Goal Shifts

Men and women are equally likely to have either changed or seriously considered changing their career goal since entering graduate school (Men: 68.6%; Women: 64.3%, *ns*). Men and women are also equally likely to have *actually* changed their career goals (determined by comparing goal when entering graduate school to current goal; Men: 33.3%; Women: 36%, *ns*).

Furthermore, men and women are similarly likely to report a research-focused professorship as their current goal (Men: 36.9%; Women: 31%, *ns*). Approximately a quarter of both men and women shifted their goals from research-focused, tenure track professor to another position (e.g., professor with an emphasis on teaching, researcher in industry; Men: 21.1%; Women: 23.9%, *ns*). Finally, men and women are similarly likely to plan to stay in academia (Men: 77.8%; Women: 78.4%, *ns*).

Discussion & Recommendations

Encouraging Results

Our report found some positive results regarding the climate on gender issues for graduate students at Princeton, and these should certainly be celebrated as a great step forward. Across gender lines, there were no differences in feelings of belonging generally at the university level, there were overall low reports of sexual objectification, low acceptance of gender-based harassment myths, and low acceptance of sexual jokes in the workplace. Both men and women agree that their advisors support their professional development, and they also do not differ in the advancement opportunities they have been encouraged to pursue. Most encouragingly, men and women report similarly low intentions to leave Princeton, and they do not differ in overall satisfaction or career goal shifts.

Gender Differences

However, our results identify several concerning differences in the experiences of graduate men and women at Princeton University. Of the highest concern are differences related to belonging and inclusion, the reporting of sexual harassment, and experiences of bias.

Women report a lower sense of belonging and greater perceived fraudulence in their departments than men, and these feelings are amplified in male-dominated departments. Lower sense of belonging and greater perceived fraudulence (imposter syndrome) in one's department predict intent to leave one's program and downshifting career goals away from R1 institutions (Collett et al., 2016; Lewis et al. 2017). Contrastingly, a greater sense of belonging and lower levels of perceived fraudulence predict greater career satisfaction, self-efficacy, and academic persistence (Freeman et al., 2007; Lewis et al., 2017; Tao & Gloria, 2018; Vergauwe et al., 2015).

Women report greater incidence of sexual objectification, which is experienced more frequently in male-dominated departments. This is accompanied by women reporting greater incidence of unwanted physical contact when interacting with their research group, at a department event or a social event with members of their field. Unfortunately, women also have lower confidence in the reporting process for sexual harassment and discrimination currently available at Princeton, and they are more likely to agree they would actually *avoid* reporting these incidences out of fear of consequences for their career.

Women also report greater incidence of Prove-it-again and Tightrope bias, particularly in male-dominated departments. Thus, graduate women, more than graduate men, feel that they have to work twice as hard to prove their competence (compared to their peers), and they also feel like there is a narrow range of behaviors acceptable for them at work. Further, women

report greater incidence of Maternal Wall bias, meaning that women, more than men, feel that having children will hurt their careers.

In addition to these central factors, our results also indicate the existence of more subtle issues that can foster a non-inclusive climate. Men are more accepting of sexual jokes and gender-based harassment, and they are more likely to perceive and resent reverse discrimination toward men. Moreover, women are more likely to have received unsolicited advice about family planning than their male colleagues and also more likely to feel pressure to return to work prematurely after having children. We also observed gender differences in perceptions of mentoring and sponsorship. In male-dominated departments, women receive less sponsorship than men and feel less comfortable reporting negative results to their advisors, differences that attenuate as the proportion of females in the department increases.

Such incidents of more subtle harassment and discrimination can create working environments in which graduate women feel more isolated and undervalued, leading to a lower overall sense of belonging. These results provide some indication of the potential mechanisms underlying the observed difference in belonging between male and female-identifying graduate students, and therefore indicate areas the administration and departments can target for improvement. There are also some important concerns outlined for men in departments with an increasing proportion of females. Overall, this leads to the conclusion that fostering more diverse and representative departments is not just a concern for graduate women, it would benefit all graduate students, regardless of gender.

Recommendations

To address issues of belonging and perceived fraudulence (imposter syndrome):

Princeton University must increase representation of women in departments at all levels while also working with departments to create welcoming cultures for these individuals. First, we suggest focusing on the lack of female visibility in male-dominated departments where issues of belonging and perceived fraudulence are exacerbated. Short-term solutions could include initiatives to invite female senior speakers for departmental seminar series, constructing a graduate curriculum that highlights the contributions of women to the field, and financially supporting students' attendance at diversity-oriented conferences for their field.

Long-term solutions should focus on improving the diversity of faculty and graduate students through the hiring and admissions process, respectively. Princeton's Molecular Biology department has implemented a financially-supported pre-application visitation weekend (Mol Bio Scholars Program) aimed at increasing the diversity of incoming graduate student cohorts. Princeton's Ecology and Evolutionary Biology department has followed suit, beginning a similar program in Fall 2018. This model could be applied to other academic departments to work towards more diverse graduate student cohorts. Second, Princeton must take steps to improve the department culture for women (some possible steps are detailed in subsequent recommendations sections). We reiterate that increasing representation of women in graduate student and faculty positions, without steps to create a more inclusive department culture, will not solve these issues. Our recommendations, arrived at independently through the results of our report, echo a recent Columbia University Equity Report that found that issues of bias and harassment follow women through the pipeline to faculty positions (Columbia University PPC, 2018). These issues are not unique to graduate women and reflect deep-seated gender-dynamic issues in academic culture that must be proactively addressed.

To address issues of sexual objectification and harassment: We can improve upon existing sensitivity training and the reporting and handling of sexual objectification and harassment incidents. In our 2015 climate report (Princeton Graduate Women in STEM Leadership Council, 2015), we recommended that the administration create a comprehensive sensitivity training for graduate students and faculty. Although sensitivity training programs have been implemented in some departments, the current report suggests that they have not been effective at eliminating sexual objectification and harassment of graduate women. The content of these training programs may need improvement, but we propose that these training programs may also not be targeted at the correct, or a wide enough, audience. Often, people who self-select to attend such training programs are more aware of and sensitive to such issues than those who do not. Further, the people who elect to attend may be aware and motivated to help, however, they may lack the tools to do so. Including simple strategies to intervene in situations of sexual objectification and harassment is one way training programs could try to bridge this gap. For example, training programs could provide attendees with example statements that can be used to disrupt potentially damaging conversations or interactions without alienating either the offender or the victim. Additional online and print resources could also be publically available for individuals who find themselves in a "bystander" role and may want to intervene.

Princeton needs to improve the trustworthiness of the reporting process and transparency of how incidences of sexual objectification and harassment are handled. The September 2018 faculty memo announcing one-year unpaid suspension for faculty members found guilty of sexual harassment made progress on this front. Sexual harassment should be considered on par with scientific misconduct in a university setting and handled as such (Columbia University PPC, 2018). However, we believe handling of previous sexual harassment cases (most notably that of Electrical Engineering faculty Sergio Verdu) may be responsible for the current lack of confidence in reporting resources. Princeton could potentially increase trustworthiness by providing testimonials on cases where reporting has been handled successfully (keeping the key details confidential to protect victim anonymity). Princeton could increase transparency by making it clear when a faculty member or other department authority is under investigation for potential sexual misconduct, especially making this information available to potential graduate students to allow them to make a fully informed decision about attending Princeton. **To address issues of mentoring and sponsorship:** There needs to be a clear channel of communication open between the administration of each department and their graduate students regarding advisor relationships. We suggest formalizing consistent, regulated feedback processes between the student and advisor via guidelines provided at the graduate school level. These guidelines could be created in consultation with faculty and graduate students from a variety of departments, so that they are as comprehensive and inclusive as possible. Although the re-enrollment period currently exists in part for this purpose, it is clear that this feedback channel is being under-utilized and is not sufficient. Improvements to the re-enrollment process, such as a mandated face-to-face meeting between advisor and student with a checklist they must work through together, and with the option of mediation via the DGS or other administrator, could provide a great starting point to build on. We are aware of similar programs at comparable institutions and have heard of their success anecdotally, for example the <u>"Individual Development Plan (IDP)" program</u> at Stanford University.

Other recommendations: A limitation of this study is that we were unable to sample an adequate number of parents. Parenthood has different effects on men's and women's academic careers; becoming a parent has been identified as an important factor in women's intentions to leave academia (e.g., Mason et al., 2013). We are aware of recent changes made by the graduate school to try and create a more inclusive environment for graduate students with families. We are hopeful that these new initiatives will help ameliorate the concerns identified in this report, and we recommend continued consultation with graduate students to ensure that this is the case.

In the supplement, we report results regarding experiences of individuals from other groups historically underrepresented in academia. The recommendations made above could also be adapted to improve the climate issues faced by LGBT+, People of Color, and other historically-underrepresented groups. This study will be used as a baseline for our group to continue to monitor the campus climate for graduate students at Princeton University.

We hope that our recommendations and results will provoke thought and discussion on how best to improve Princeton's climate, and ultimately, that the administration will take further steps to ensure that Princeton is an environment in which all students, regardless of identity, thrive.

Supplement

Background

The issues (discussed in the main body of this text) that contribute to underrepresentation of women in academia also affect other historically disadvantaged groups (e.g., LGBT individuals, People of Color, first-generation college students; Atherton et al., 2016; Jury et al., 2017; Ong et al., 2011).

While the main focus of this report was specifically on the climate for graduate women at Princeton University, we have included additional results on responses for LGBQA individuals and on the experiences of racial bias by racial minorities. We hope that steps taken to address the issues faced by graduate women will also improve the climate for individuals of other groups by creating more inclusive departments for all persons.

Belonging

Belonging & Inclusion

Individuals who identify as straight report a stronger sense of belonging and inclusion compared to individuals who identify as lesbian, gay, bisexual, queer, asexual, or other (LGBQA; p < .05).



Figure S1. Average belonging & inclusion by sexual orientation. Error bars represent ± 1 SE. * = p < .05

Belonging (Princeton, Department, Research Group)

Individuals who identify as LGBQA report lower belonging at Princeton and in their departments than individuals who identify as straight (p < .05).



Figures S2 & S3. Average belonging at Princeton and in department by sexual orientation. Error bars represent ± 1 SE. * = p < .05

Perceived Fraudulence (Imposter Syndrome)

Across departments, LGBQA individuals report greater levels of perceived fraudulence than straight individuals (p < .05).



Figure S4. Average perceived fraudulence by sexual orientation. Error bars represent \pm 1 SE. * = p < .05

Sexual Objectification & Harassment

Awareness and Likelihood of using Princeton Resources

LGBQA individuals are more likely than straight individuals to avoid reporting harassment or discrimination out of fear of negative consequences for their careers (p < .05).



Figure S5. Likelihood of avoiding reporting harassment or discrimination to Princeton by sexual orientation. Error bars represent ± 1 SE. * = p < .05

White women and People of Color are more likely than White men to avoid reporting harassment or discrimination p's < .05).



Figure S6. Likelihood of using Princeton resources by race and gender. Error bars represent ± 1 SE. * = p < .05; ** = p < .01; *** = p < .001

Experiencing Bias

People of Color report experiencing Tug of War bias more than White people do (p < .01).



Racial Bias

In addition to the measures described in the main report, we included the following additional measures of bias toward people of Asian descent and People of Color¹³:

Bias against people of Asian descent. 12 items assessed bias against people of Asian descent (a = .80; Center for Worklife Law, 2018). Example items: "Coworkers assume I am an immigrant"; "People expect me to be passive and quiet."

Bias against all People of Color. 5 items assessed bias against all People of Color (a = .71; Center for Worklife Law, 2018). Example item: "Coworkers have implied I have received unfair advantages because of my race."

Women and men who identify as Asian report experiencing greater bias against people of Asian descent than women and men who do not identify as Asian (p's < .05). Asian women report experiencing more of this type of bias than Asian men do (p < .01).

¹³ Measures of bias against African-American and Latinx people were also included in the survey; however, the number of people identifying as African-American or Latinx was too small to permit comparisons. Accordingly, we do not discuss these measures further.



Figure S8. Bias against people of Asian descent by race and gender. Error bars represent ± 1 SE. * = p < .05; ** = p < .01; *** = p < .001.

Women and Men of Color report experiencing greater bias against all People of Color than White women and men (p's < .05). Women of Color report experiencing marginally more of this type of bias than Men of Color do (p = .07).



Figure S9. Bias against all People of Color by race and gender. Error bars represent ± 1 SE. $\dagger = p < .10$. * = p < .05; ** = p < .01; *** = p < .01.

Satisfaction with Graduate School Experience Overall Satisfaction

Men of Color, relative to White men, report lower satisfaction with interactions with other graduate students (p < .01).



Satisfaction with Interactions with Fellow Students

Figure S10. Satisfaction with interactions with fellow graduate students by race and gender. Error bars represent ± 1 SE. * = p < .05; ** = p < .01; *** = p < .001.

LGBQA individuals, relative to straight individuals, report lower satisfaction with departmental support for career-life balance (p < .05).



Figure S11. Satisfaction with departmental support for career-life balance by sexual orientation. Error bars represent \pm 1 SE. * = p < .05.

Students from outside of the US, relative to students from the US, report lower satisfaction with their overall career and life situation (p < .01).





Intent to Leave

LGBQA individuals, relative to straight individuals, report higher intentions to leave Princeton (*p* < .05).



Figure S13. Student intent to leave Princeton by sexual orientation. Error bars represent ± 1 SE. * = p < .05.

Career Goal Shifts

First-generation college students, relative to individuals who are continuing-generation students, are more likely to have either changed or seriously considered changing their career goal since entering graduate school (First-generation: 83.4%; Continuing-generation: 63.4%, p < .01). People of Color, relative to Whites, more likely to shift their career goals away from positions in academia (People of Color: 28.7%; Whites: 17.2%, p < .05).

Summary

LGBQA. Individuals who identify as lesbian, gay, bisexual, queer, asexual, or other report a lower sense of belonging and inclusion, and a lower sense of belonging in their departments and at Princeton, relative to individuals who identify as straight. LGBQA individuals also report a higher sense of perceived fraudulence compared to straight individuals. LGBQA individuals are more likely to avoid reporting harassment or discrimination, relative to straight individuals and White individuals. This latter finding is particularly striking given the results of the Princeton WeSpeak survey, which found that individuals identifying as LGBT+ were at increased risk for sexual misconduct, rape, sexual harassment, or intimate partner abuse (Princeton University, 2017). Finally, relative to straight individuals, LGBQA individuals report less satisfaction with departmental support for career-life balance, and ultimately, higher intentions to leave Princeton.

People of Color. Individuals who identify as Black/African American, Hispanic/Latin American, Asian/Asian-American, Middle Eastern/Arab American, Native American, or other report

experiencing more Tug of War bias and bias against all People of Color than individuals who identify as White. Asian and Asian-American individuals report experiencing greater bias against people of Asian descent relative to other groups. Further, Women of Color report experiencing racial bias to a greater extent than Men of Color. Similar to LGBQA individuals, People of Color are reluctant to report harassment or discrimination (relative to White men). Men of Color, relative to White men, also report lower satisfaction with interactions with other graduate students. Finally, People of Color, relative to White individuals, are more likely to shift their career goals away from positions in academia.

Other groups. In addition to the above findings, we find that international graduate students report lower overall career and life satisfaction than domestic students. We also find that first-generation college students (relative to those who are continuing-generation students) are more likely to have either changed or seriously considered changing their career goal since entering graduate school.

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