

# Academic Professional Development for PhD Students in Selected Science Fields: Who is Participating?

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## Introduction

During PhD study, professional development (PD) opportunities are crucial for preparing students for future careers and providing a sense of community within graduate school (Mitic & Okahana, 2021; Rizzolo et al., 2016). Given the usefulness of PD for PhD students, it is important to understand who participates in academic PD and what types of opportunities are available. Academic PD is defined as PD that focuses on skills related to the academic portion of the PhD (i.e., academic writing, data analytics, etc.), whereas other PD includes interpersonal skills like leadership, networking, public speaking, etc.

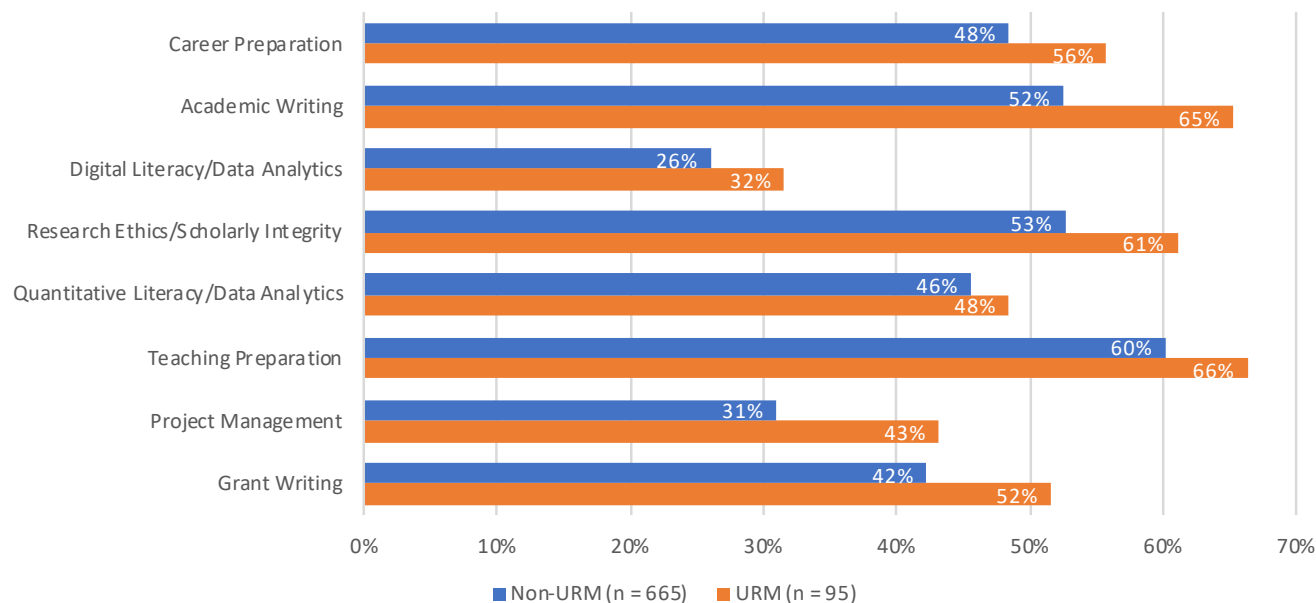
This brief provides insight into science PhD students' participation in academic PD and how participation differs by race and gender using data from the Council of Graduate Schools' PhD Career Pathways project. Given that minority graduate students and women remain underrepresented in science graduate education and in the academic workforce, uncovering differences in participation can help us understand the potential impacts of these PD investments as well as opportunities for making academic PD more inclusive (Zhou & Gao, 2021). For this brief, we focused our analysis on doctoral students in selected science fields, including life and health sciences, physical and earth sciences, engineering, math, and computer science. We define underrepresented minority (URM) doctoral students as American Indian/Alaska Native, Black/African American, Hispanic, and Native Hawaiian and Pacific Islander and non-URM doctoral students as White and Asian.

## Key Findings:

**Underrepresented Minority Doctoral Students Have Greater Participation in Academic PD.** URM science doctoral students have greater participation in each category of academic PD (**Figure 1**) than non-URM doctoral students. The largest differences between URM and non-URM science doctoral students were participation in project management (12% points) and academic writing (13% points).



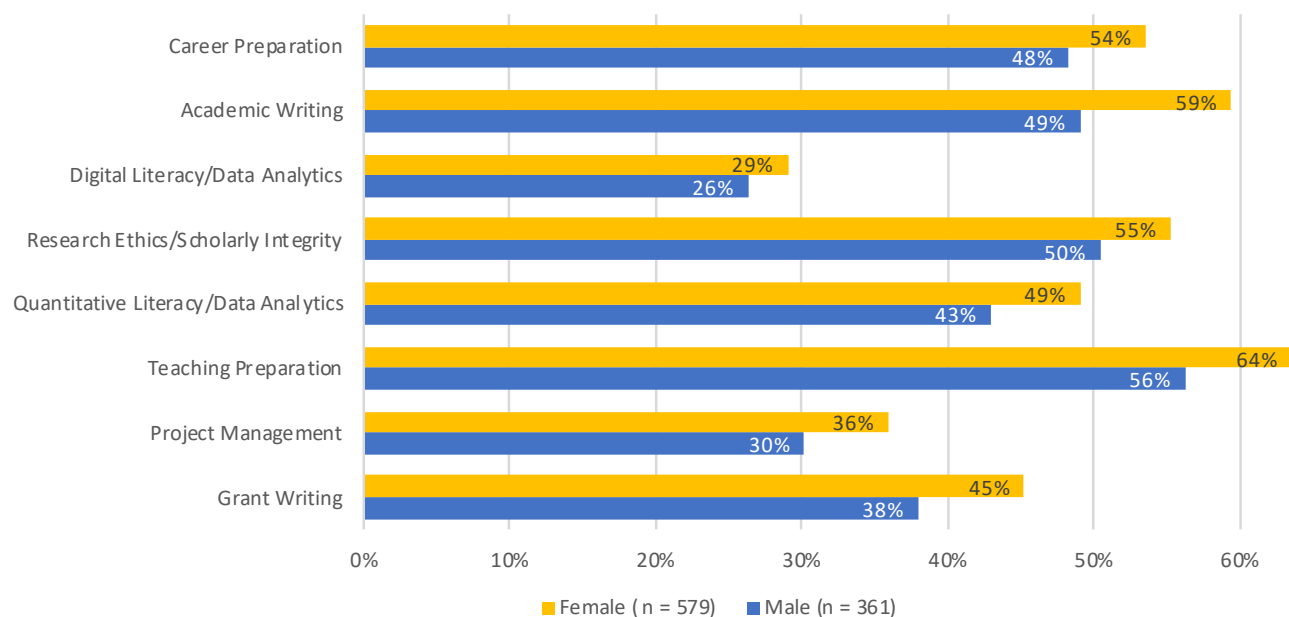
Figure 1. Professional Development Participation for Science Doctoral Students by Race



Data Source: Council of Graduate Schools, *Understanding PhD Career Pathways for Program Improvement, Follow-up Student Survey*.

**Participation in Academic PD Varies by Gender<sup>1</sup>.** Women participated in PD at higher rates than men among science doctoral students (Figure 2). The largest difference between male and female science doctoral students was in academic writing with a 10%-point difference in participation.

Figure 2. Professional Development Participation for Science Doctoral Students by Gender



Data Source: Council of Graduate Schools, *Understanding PhD Career Pathways for Program Improvement, Follow-up Student Survey*.

1 Due to the small number of respondents in the gender non-binary and another gender not listed categories, their data were suppressed for this brief.



## Science Doctoral Students Participate in Professional Development Opportunities Sponsored by PhD Programs.

Across most academic focused PD opportunities, science doctoral students largely participate in opportunities sponsored by their PhD program rather than in institution-sponsored opportunities and opportunities outside of the institution (**Table 1**). The only exception is career preparation (i.e. CV preparation, interviewing), where students are participating at a greater rate in institution-wide opportunities.

**Table 1.** In what types of professional development opportunities have you participated since starting your doctorate program?

	PhD Program Sponsored Opportunity	Institution Sponsored Opportunity	Opportunity Outside of the Institution
Career preparation (i.e. CV preparation, interviewing)	24%	32%	14%
Academic writing	41%	23%	12%
Digital literacy/Data analytics	14%	14%	8%
Research ethics/Scholarly integrity	37%	26%	7%
Quantitative literacy/Data analytics	34%	19%	12%
Teaching preparation	41%	35%	9%
Project Management	19%	12%	11%
Grant Writing	29%	16%	8%

Data Source: Council of Graduate Schools, *Understanding PhD Career Pathways for Program Improvement, Follow-up Student Survey*.

## Conversation Starters for PhD Program Improvement

We encourage graduate schools and science graduate departments to engage in conversations about PD opportunities and whether these opportunities are inclusive in content for all students. Questions you may want to ask your graduate school staff, college deans, and graduate program directors include:

- How can your institution increase participation in PD among all students?
- URM and women are generally underrepresented in science, yet they are participating in professional development at greater rates. How are PD opportunities developed to benefit the diverse needs of student's participating?
- Given that science doctoral students are largely participating in PD within their PhD program, how can institutions ensure that centrally-offered PD opportunities complement those that are available within their PhD program?
- How can graduate schools and graduate programs work together to ensure science doctoral students have opportunities for PD?
- Academic writing is a critical skill for science doctoral students and one that students, especially women and URM doctoral students, are participating in at the program level. In cases where programs do not offer this form of academic PD, does your institution have a plan for providing or encouraging programs in this area?
- Why are women and URM students participating in PD at greater rates? Is PD a source of community and place for building a professional identity for women and URM students in particular? Is it a place to validate interests in diverse careers?



## Takeaway Points

- Of the students participating in our study, those from minoritized background in science (i.e., persons of color and women) had greater participation in academic professional development than non-minoritized counterparts. In the wake of the pandemic, many universities have sought to reduce costs for PD services for graduate students. Yet such decisions may undermine campus diversity efforts. The fact that students from minoritized background participate in higher numbers in these opportunities should be considered when universities make decisions about resource investments.
- Our study cannot speak to why minoritized students participate in PD in higher numbers; however, prior literature has found that science doctoral students from minoritized backgrounds experience imposter syndrome (Chakraverty, 2019; O'Meara et al., 2019) and challenges adjusting to academic culture (Posselt, 2018; Willison & Gibson, 2011). These professional development opportunities may serve not only to upskill doctoral students, but also to provide validation, support in forming a professional identity, and a sense of community among minoritized students.
- Of the three PD sponsored opportunities (PhD program, institution-based, and outside the institution), science students participated largely in PhD program sponsored opportunities. This is not surprising since much of doctoral training is nested at the disciplinary level. Given that many graduate students seek PD opportunities from their programs, it is important that graduate schools work with graduate programs to make sure that students have access to high-quality PD opportunities regardless of their home departments.
- Academic writing and teaching preparation are the PD opportunities with the highest students participation levels. Academic writing had the largest participation difference by race and gender, with female and URM doctoral students participating at greater rates than male and non-URM students.
- General career preparation was the area in which more students took PD opportunities from the graduate school rather than from their program. This might suggest that much of career services are provided by centralized units, and not necessarily at the program and faculty-level.

## References

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## Additional Resources

**CGS Resources for Graduate Student Professional Development:** CGS has led a series of Best Practices projects in the professional development domain, including a project on STEM Professional Development, the NextGen PhD Consortium, and the Humanities Coalition. Project reports and resulting resources for graduate schools are available on the [CGS website](#).

Supported by the National Science Foundation (NSF), the [Innovations in Graduate Education \(IGE\)](#) program is "designed to encourage the development and implementation of bold, new, and potentially transformative approaches to STEM graduate education training." To accelerate innovation in graduate education, the IGE Hub provides a platform for sharing resources on STEM graduate education and professional development, engaging Minority Serving Institutions, and supporting collaboration among IGE teams and the broader graduate community.

**Graduate Career Consortium (GCC):** Since 1987, the Graduate Career Consortium is a 400+ member organization of higher education professionals who work with graduate students and postdoctoral associates on issues related to career and professional development. Learn more about the [Graduate Career Consortium](#).

## About the Data Source

The CGS PhD Career Pathways Project Follow-Up Student Survey was distributed in summer 2020 to PhD students and recent alumni who participated in a baseline student survey for the CGS PhD Career Pathways Project between 2017-2019. This brief is based upon this aggregated data set, which includes 953 science doctoral students.

## The CGS PhD Career Pathways Coalition

CGS PhD Career Pathways is a coalition of 75 doctoral institutions working to better understand and support PhD careers across all broad fields of study. Over the course of the project, universities will continue collecting data from current PhD students and alumni using surveys that were developed by CGS in consultation with senior university leaders, funding agencies, disciplinary societies, researchers, and PhD students and alumni. The resulting data are allowing universities to analyze PhD career preferences and outcomes at the program level and help faculty and university leaders strengthen career services, professional development opportunities, and mentoring.

## About CGS

For over 60 years, the Council of Graduate Schools has been the only national organization dedicated solely to advancing master's and doctoral education and research. CGS members award 86.9% of all U.S. doctoral degrees and 59.8% of all U.S. master's degrees. CGS accomplishes its mission through advocacy, the development and dissemination of best practices, and innovative research.

*The brief was prepared by Ariana L. Garcia and Enyu Zhou. A. G. prepared an initial draft and E. Z. prepared data tables. Hironao Okahana directed the underlying research activities and supervised the analysis for this work. Radomir Ray Mitic conducted data collection and preparation of the follow-up survey. Suzanne T. Ortega, Hironao Okahana, and Julia Kent reviewed and commented on earlier drafts. Matthew Linton provided production support. This brief is based on work supported by grants from The Andrew W. Mellon Foundation (grant numbers 31600612 and 1809-06155) and the National Science Foundation (grant numbers 1661272 and 2000750). Any opinions, findings, and conclusions or recommendations expressed in this brief do not necessarily reflect the views of the funders.*