PhD Career Pathways

A PROJECT OF THE COUNCIL OF GRADUATE SCHOOLS

Understanding and Supporting PhD Careers

A Resource for Universities

CGS COUNCIL OF GRADUATE SCHOOLS

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ISBN-13: 978-1-933042-59-6

Printed in the United States of America.

Suggested Citation: Council of Graduate Schools (2025). Understanding and supporting PhD Careers: A resource for universities. Washington, DC: the Author. DOI: 10.17605/OSF.IO/69QTG

About the Report

PhD Career Pathways was a multi-phase project to improve doctoral education through data collection, information-sharing, university networks, and resource development. With support from the National Science Foundation, the Mellon Foundation, and the Alfred P. Sloan Foundation, CGS built a coalition of 75 doctoral institutions working to collect data about PhD careers and use this information to improve doctoral education. This report provides the most comprehensive summary to date of findings from the project's large, multi-institutional dataset, which since 2017, have been released in a series of research briefs exploring specific issues in doctoral education and careers. This publication also includes guidance for communicating the value of diverse PhD careers and collecting and using PhD career data at the university level.

About the Council of Graduate Schools (CGS)

CGS is an association of 460 graduate institutions dedicated to advancing graduate education and research. In collaboration with our members, we advocate for graduate education, develop innovative research, and establish best practices. Our projects generate information and data that help graduate deans and their institutions better support graduate students and programs.

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Acknowledgments

The Council of Graduate Schools acknowledges the generous support of funders that invested in the PhD Career Pathways project at different stages of the initiative: the National Science Foundation, the Alfred P. Sloan Foundation, and the Mellon Foundation. We thank these organizations for giving both credibility and visibility to national efforts to improve doctoral education.

We also express our gratitude to the graduate deans, researchers and disciplinary society leaders who served on the advisory committees listed in Appendix B of this resource. Their guidance was critical in informing and improving the research instruments and other resources developed in this project. Developing campus-wide efforts to understand and improve PhD careers required hard work and serious commitments. For this we thank the universities that contributed to the data collection and program improvements described in this resource (see Appendix A) and to the PhD students and alumni who shared their career aspirations and experiences.

Portions of this resource are based on previous CGS publications that are cited throughout the text. We give particular thanks to former CGS staff who led and contributed to this work: Hironao Okahana, Ryan Bradshaw, Jeffrey Engler, Janet Gao, Ariana Garcia, Ahjah Johnson, Timothy Kinoshita, Maureen McCarthy, Radomir Ray Mitic, and Christian West. Brian McKenzie, formerly CGS's Director of Research, led the development of the data dashboard that accompanies this report. Jeffrey Allum led the CGS research department during the feasibility study and the early stages of project implementation.

This material is partially based upon work supported by the National Science Foundation under grants #1661272 and #2000750. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Introduction: Why collect data on PhD Careers?

There are plenty of myths about doctoral education. Some of these myths circulate outside universities; we are all familiar with the negative image of universities as "ivory towers" where faculty and administrators lose touch with real-world problems and issues. These myths are damaging to the reputation of universities and limit our ability to have meaningful, positive impacts in our communities and beyond.

Some myths are more common inside universities: the idea that most or all PhD graduates go on to academic jobs, or worse, that positions in industry, non-profits, or government are only for students who are less talented or accomplished. These myths are damaging to student morale and may negatively impact time-to-degree and completion rates in addition to limiting the impact of student and alumni research and scholarship. According to data from sources such as the PhD career pathways survey, which is cited throughout this report, as well as the Survey of Doctoral Recipients (NCSES, 2024,) the American Academy of Arts and Sciences' Humanities Indicators survey (The Academy, 2022,) and Where Historians Work, an interactive database of history PhD career outcomes (Shannon & Swafford, October 2022; Swafford & Ruediger, July 2018) these beliefs have no grounding in evidence.

Perceptions of the value of the PhD were a central concern when CGS launched the PhD Career Pathways initiative in 2014. According to the most recent data from the Survey of Doctoral Recipients, only about 34% of doctorate recipients with non-postdoctoral employment surveyed in 2023 were employed in academia, a decrease of about 20% from 2003 (NCSES, 2024, p. 25). For many years, universities paid relatively little attention to this quiet majority of PhD workers who had spent years training on their campuses. To give an accurate account of what PhDs do, the skills they use in their careers, and the satisfaction they take in their training, we believed that it was important to collect better information from PhD alumni about their careers and to help universities to use these data to improve the quality of doctoral education.

We also knew that PhDs were entering a rapidly changing workforce that would increasingly rely upon their skills and knowledge—across and between a wide variety of sectors (Ortega & Kent, 2018). The current and future workforce will require PhD holders to play a critical role in solving our nation's biggest challenges, from harnessing artificial intelligence to solving public health crises. Based on anecdotal evidence from graduate deans, we knew that many PhD alumni were already engaged in important efforts to solve such challenges across all sectors of the workforce. How, then, could we represent the variety of important PhD careers with data? How could we use what we learned to bring PhD training and future workforce needs into greater alignment?

Working with researchers and graduate deans at CGS member institutions, CGS completed a one-year study to explore the feasibility of collecting data about PhD careers and using these data to inform improvements to PhD programs. This study confirmed what we already suspected: that there was a great interest among doctoral institutions in better understanding PhD careers and a willingness to use common instruments to collect and compare findings. Following a survey design phase in 2015, 75 universities committed to

collecting data through two instruments: a survey of current doctoral students about their career aspirations and a survey of PhD alumni three, eight, and 15 years post-graduation.

This report provides the most comprehensive summary to date of findings from the project's large, multi-institutional dataset, which since 2017, have been released in a series of research briefs exploring specific issues in doctoral education and careers. Accompanying the quantitative data from the surveys are quotes from PhD alumni who were interviewed by CGS as part of supplementary qualitative research.

The release of this report also coincides with the release of a new data dashboard that provides interactive data drawn from the 25,000 individual responses to the PhD alumni survey. Universities can use the dashboard to understand the job sectors where PhDs are working, their income range, and how they rate the importance of various skills to their current job performance. The dashboard also presents data on job satisfaction as measured by whether alumni would pursue the degree again. Dashboard users can break down data by gender, field of study, time elapsed since graduation, and type of institution where the degree was completed, among other factors. The multi-institutional dataset can help universities contextualize the career outcomes of their own PhDs and improve professional development and career services for doctoral students.

Taken together, this report and accompanying data dashboard may help:

- **Graduate deans** and other university leaders design and launch efforts to improve the collection and use of data on PhD career pathways;
- **Faculty** improve communications with prospective and current graduate students about career prospects for PhD alumni;
- **Graduate career professionals** and Career Service offices improve professional development programming for doctoral students; and
- **Current and prospective graduate students** better understand the skills needed to succeed in their careers.

The PhD Career Pathways project was designed to help all of these groups work together to improve the career prospects and experiences of PhDs, and the activities outlined above need not belong to any one group alone. For this reason, we hope that this resource provides the inspiration and information needed to develop cross-campus efforts to improve PhD education—and career outcomes—for all students.

1: Shaping New Narratives about PhD Careers

Shaping new narratives about PhD careers requires careful attention to language. As a foundation for future sections, we foreground some commonly held beliefs about PhD education that are overtly or unconsciously conveyed by common terms and ideas. We also provide suggestions for actively advocating for career diversity on campus. The success of university efforts to improve doctoral education depends on clear and consistent communication from different groups, from faculty to administrators in the graduate school to graduate career counselors.

Rethinking Common Terms about PhD Careers

Many terms, concepts and widely-held beliefs undermine the importance of student choice in navigating careers. The PhD Career Pathways project helped us to identify common assumptions and ways to avoid them in conversation and broader communications. As a first step toward shifting mindsets about PhD careers, we recommend that universities do the following:

- *Specifically name and value work in different job sectors.* Many of the terms and concepts we currently use define careers in the Business, Government and Non-Profit sectors by what they are not—"non-academic" or "alternatives" to academic careers. **See figure 1** for inclusive ways to talk about PhD careers.
- *Help students imagine their career or careers as a lifelong journey, not a single endpoint.* Avoid language that reinforces the assumption that PhD careers are limited to one job sector over a lifetime. Recent CGS data suggest that PhD careers include more movement between sectors than we might assume. Prepare students for lifelong learning and the possibility of movement.
- *Use terms that demonstrate equal respect for different types of skills.* For example, sometimes terms used to describe social skills such as collaboration and communications ("soft skills") imply that these skills are less important than traditional academic skills. Some institutions use the term "essential skills" to put traditional academic and social skills on an equal footing.

Figure 1: Inclusive language options for talking about humanities PhD careers*

Instead of…	You could talk about…
The Profession	Professional careers
	Humanities careers
	Academia (one possibility among many)
The job market	Job markets
	The *academic* job market (one possibility among many)
Nonacademic careers	Careers beyond academia
Alternative careers	Pathways beyond the professoriate
Non-professorial careers	BGN careers (Business, Government, and Nonprofit)
Plan B	Career of choice
Backup options	Broad options
	Career diversity
	Flexible career paths
	Versatile humanists
	Career horizons/pathways
	Repertoire of possibilities
Networking	Building (intellectual/professional) communities
	Building connections
	Building relationships
Job placement	First position
	First destination
	Career entry point
PhDs as produced	PhDs as earned

Source: McCarthy, M. (2017). Promising Practices in Humanities PhD Professional Development. *Council of Graduate Schools.*
https://cgsnet.org/publication-pdf/5049/NEH_NextGen_LessonsLearned.pdf

Advocating for Career Diversity

Academic career preparation is a central part of graduate program culture, and the lack of information and visibility for careers in other fields sends an implicit message that these careers are less important. Advocacy for career diversity requires proactive communication to fill this gap. CGS has compiled the following list of messages about career diversity and related topics to help faculty, students and graduate deans create new narratives about career diversity on campus. These messages are designed to be adapted to an institution's or program's missions and goals.

Of course, at every institution, "official" messages about PhD careers may not align with student experiences. A graduate school may promote the value of career diversity while a particular graduate program does not. A department may encourage the use of Individual Development Plans (IDPs)—resources that rely on student

agency and choice in navigating career options— while some faculty members may send the message that there is only one path to success. Students themselves may reinforce the idea that the professoriate is a noble ideal while working in other sectors amounts to "selling out."

Strong messages about career diversity will not, by themselves, change limiting ways of understanding different career pathways. Culture change requires change at multiple levels and significant changes to university reward structures. Language plays a critical role in challenging entrenched ideas, however, and the following messages can make a difference if they are used consistently and with sincerity:

Why is career diversity for PhDs important?

- *A PhD can serve as a path to a variety of rewarding careers.* PhD alumni have leadership roles in industry, the non-profit sector and government.
- *The importance of career diversity is now widely recognized and encouraged.* Most major funders and scientific and scholarly societies support this concept—including the National Science Foundation, the National Institutes of Health, the National Academies, the Council of Graduate Schools, the Association of American Universities, and disciplinary societies in the Humanities and STEM fields.
- *Supporting career options for students benefits graduate programs.* Benefits may include:
    - Better student morale as they face a broader variety of options for their futures.
    - The ability to recruit talented students who aspire to have a research or research-related career outside of academia.
    - The ability to demonstrate the impact of PhDs in all sectors of the workforce.
    - Alumni-offered internships and other experiential learning opportunities for current graduate students.
    - Opportunities for future collaborations between our university/program and employers who value the research we produce.

Who is responsible for providing career support and professional development for PhDs?

- *Both PhD candidates and their advisors are responsible for communicating about career planning and professional development.* Creating a relationship where the student can speak openly about career goals is key. Conversations about career preparation should happen early and often as a student's goals and circumstances evolve.
- *Professional development experiences may be offered by faculty, the graduate school, employers, career services, and alumni.* Faculty members should create the space for students to pursue a variety of experiences. Students should show initiative in selecting and pursuing them.

Is professional development just for students seeking jobs outside academia?

- *All students benefit from greater awareness of career options and intentional professional development—including those bound for academia.*
- *While there are more similarities than differences among valued skills and knowledge in post-PhD careers, the weight placed on types of skills and knowledge may vary.* For example, according to CGS data, teaching skills are considered more important by PhDs working in four-year colleges and community colleges, whereas research skills are considered more important at institutions of high research intensity.
    - Many students go on to teach in universities different from the ones where they do their PhDs. Students aspiring to academic careers can benefit from learning about the variety of higher education contexts where they may teach over the course of their careers.

- *Supporting students who want to have an impact at four-year institutions or in community colleges aligns with our institution's (or program's) mission.* Many four-year institutions and community colleges are pipelines to B.A.'s and advanced degrees for underrepresented and first-generation students.

Give PhD students and alumni an opportunity to tell their stories

Data about PhD career pathways can challenge common myths about PhD careers. The next chapter goes into greater detail about how to collect and use data. But telling stories of individual PhD students and alumni pursuing a variety of career options in and outside of academia are important ways of humanizing career data. Whether these stories appear in an alumni magazine, a newsletter, or on social media, they give tangible evidence of why different kinds of work matter—to degree candidates, to the university, to the communities they serve. And for a PhD student trying to build a future post-graduation, stories of successful students and alumni can provide inspiration and ideas for moving from point A to B.

Using Social Media, Websites and Newsletters to Communicate the Value of Career Diversity

Social media tools such as LinkedIn can be important tools for communicating the value of PhD career transparency and diversity. Strategies for using social media may include:

- Posting Stories of PhD alumni having an important impact in a broad range of careers.
- Celebrating current students completing internships in industry, government and non-profits.
- Creating professional networking groups (via LinkedIn or Handshake) for PhD students and alumni.
- Highlighting events to support career awareness and professional development among PhD students.
- Celebrating faculty and staff who have worked to support career diversity in their programs or offices.

Getting Support from University Leaders

CGS recognizes that many faculty and students may feel ambivalent about recognizing and celebrating PhD careers in fields outside of academia. Faculty may worry about the impact of career diversity on their program's reputation as a "producer" of tenure-track faculty. Students, for their part, may feel uncertainty and grief about letting go of an academic identity and following a different professional path.

University leaders, funders of research, and graduate program directors can mitigate these concerns by sending a clear and consistent message: PhDs do important and meaningful work across all sectors of the workforce. Not only are careers outside of the academy acceptable, careers in the Business, Government, and Non-Profit (BGN) sectors should be celebrated as an important part of the institution and program's impact. These words should be accompanied by specific actions that demonstrate the university's commitment to supporting a variety of career pathways as well as a broad range of work developed by their students and alumni.

2: Collecting and Communicating Data

Background on CGS Data Collection Activities

A central goal of the CGS PhD Career Pathways project was generating program-level data on PhD student and alumni experiences. The project evolved through several phases. A feasibility study (2014) identified the need for more granular PhD career pathways information (Allum, Kent & McCarthy, 2014) at the program level. In this phase of work, CGS learned that national data were often not compelling or useful enough to inform change in a particular program. We heard that additional data were needed to complement existing federal datasets such as the Survey of Earned Doctorates (SED) and Survey of Doctorate Recipients (SDR). These recommendations were reinforced by a major finding of the National Academies of Sciences, Engineering, and Medicine (NASEM) study on graduate education, that "Graduate programs should collect, update and make freely and easily accessible to current and prospective students' information about master's and PhD-level educational outcomes" (NASEM, p. 7).

An instrument design phase (2015–2017) resulted in two survey instruments. The first, a student survey, captured the career aspirations and program experiences of second and fifth-year PhD students. The rationale for collecting data among students at years two and five of the program is that student career interests may evolve over the course of their study. The second instrument, an alumni survey, captured PhD alumni career experiences from three, eight, and 15 years past graduation. The decision to collect alumni career data at three different points well beyond graduation was driven by the hypothesis that first jobs were not indicators of long-term career outcomes.

The survey implementation phase (2017–2021) was designed to identify best practices in implementing the two surveys and to generate aggregate data on PhD career pathways. CGS issued a call for proposals in March 2017, supported by the National Science Foundation and the Mellon Foundation, that resulted in 15 awards to 29 institutions committed to collecting data from PhD students and alumni in STEM and Humanities fields for three years.[1] In April 2018, CGS issued a second call for proposals resulting in awards to four additional Minority-Serving Institutions, beyond those included in the first group of grantees. Additionally, over 30 institutions, motivated by the opportunity to contribute data to the aggregate dataset and benchmark their findings against the larger group of institutions, joined the project as unfunded affiliates. A list of institutions that participated in data collection and reporting can be found in Appendix A.

1 Some of the awardees were part of institutional consortia, the largest of which was the University of California system.

Potential Benefits of Collecting PhD Career Pathways Data

Help Graduate Schools

- Assess and improve programs.
- Increase the visibility of diverse career pathways.
- Understand the valuable work alumni do in various sectors.
- Develop relationships with alumni.
- Advocate for the importance of graduate education.

Help Faculty

- Identify and articulate program goals.
- Develop and refine curricula aligned with student career aspirations and workforce needs.
- Continue to improve their own mentorship and support communities where mentorship is valued.
- Help students identify and pursue professional development opportunities.
- Assess the influence of programs on their students' career trajectories.

Help Graduate Students

- Select a PhD program that aligns with their career goals.
- Understand pathways into a range of careers and prepare accordingly.
- Advocate for their professional development needs.
- Persist in a program they may otherwise have left because they did not fully understand the range of career options available to them with a doctorate.

To inform the collection and use of data about PhD career pathways at the institution and program level, CGS consulted diverse voices: current PhD students and alumni; graduate deans; provosts; institutional research professionals; disciplinary association leaders; federal data experts; users of federal datasets on PhD careers; and survey design experts. Collectively, these groups identified a range of benefits of collecting PhD career pathways data, giving particular attention to the ways that this information might inform PhD program improvement. The call-out box above identifies some of the main benefits identified.

Developing a Data Collection Strategy

While the PhD Career Pathways survey instruments are still widely used by graduate institutions, CGS recognizes that each university may use a variety of methods for data collection. The remainder of this section focuses on lessons learned from the implementation of our survey that are relevant to a variety of instruments and approaches.

Key Questions

A long-term strategy developed in conversation with key groups on campus is essential to any successful data-collection effort. The following broad questions are designed to help universities develop a strategy for implementing the surveys and make a plan to use resulting data.

1. How does the collection of PhD career data support the mission and strategic plan of our institution/ graduate school/PhD programs?
2. What goals could we accomplish if we had better information about the careers of PhDs—in our programs and in other areas of the institution?
3. Are there risks or challenges that we are likely to encounter in collecting PhD career pathways information? How will we overcome them?
4. Do we have the capacity to get the effort off the ground, or will we need additional support? For example, do we have the infrastructure and statistical support to collect and manage the data?
5. What current efforts exist to provide information on the careers of our PhD alumni? Can this effort be merged with others?
6. Which groups and individuals might serve as allies, even if they are not directly involved?
7. How can we ensure this effort is sustainable? Are there ways to integrate our work into existing university processes?
8. How will we communicate the value of this work to various groups on campus? How in particular can we help create a broader definition (beyond academic careers) of what constitutes career success for PhD alumni?

Institutions planning a new effort are encouraged to create an Advisory Committee or similar group charged with identifying long-term challenges and approaches to overcoming them. The call-out box below provides guidance for planning a sustainable effort.

Planning for Sustainability

1. Identify **clear goals.**

Identify specific, measurable objectives that your graduate institution would like to realize as a result of the data collection effort. Every aspect of communication with campus and external groups will be more focused when goals are consistently communicated.

2. Use survey findings to address **multiple university needs.**

Data collection efforts that are strategically aligned with selected campus units and institutional priorities are more likely to be sustainable. Mission or strategy-aligned efforts may also benefit from greater credibility and more resources. Which campus units and institutional priorities beyond the improvement of PhD programs might be served by knowing what PhD alumni do long-term?

Examples include:

- improving graduate career services
- increasing alumni engagement in professional development activities for graduate students
- improving alumni relations
- identifying graduate internship sites
- developing research collaborations with the private sector
- strengthening advocacy efforts on behalf of PhD programs
- recruitment of PhD students

3. Tie efforts to funder **requirements** and to **accountability efforts.**

The National Institutes of Health (NIH) requires grant recipients to record doctoral alumni career information 15 years post-graduation. At some institutions, this requirement has helped build faculty support for efforts to collect information on alumni careers. While it is not possible to predict the future requirements of federal funders, it is safe to say that federal and private funders will continue and perhaps increase their demands that institutions and their faculty measure the outcomes of investments in PhD education and training. Highlighting this trend may help planning groups make the case for improved data collection about PhD careers.

4. Use data to inform **program review.**

Requiring the collection of PhD career data for the process of PhD program review is one approach to ensuring that PhD data are collected across a diverse range of programs. In framing conversations with faculty about using such data in program review processes, it is important for graduate deans to support broad conceptions of successful employment to include careers in the business, government and non-profit sectors.

Collaboration and Communication

To ensure PhD data collection strategically addresses multiple campus needs, it's important to communicate early with a variety of key groups on campus. Graduate deans and graduate schools are particularly well-positioned to lead this effort because they often hold primary responsibility for the quality of PhD programs on campus and can build alliances with programs as well as central offices. The following table identifies potential campus groups and potential actions to engage their support in collecting and using PhD career data.

Communicating with Campus Groups about Data Collection

Campus Group	Possible Actions
President's Office, Provost, Vice President for Research	Identify ways that collection of PhD career pathways information aligns with mission. Identify multiple ways that resulting data could benefit different groups. Enlist support and/or public endorsement of efforts to collect PhD career pathways information.
Academic Units	Communicate the values and principles motivating data collection and goals of the effort. Clearly communicate any requirements and expectations surrounding survey implementation. Gather input on sharing and using the survey data with faculty, staff (especially at centers, such as Humanities centers), and alumni. Identify ways that collection of PhD career pathways information aligns with strategic program goals, and how it might be incorporated into program review. Plan to report to faculty findings of data collected in a timely way.
PhD Students	Encourage a culture of data collection and feedback with students by asking early and often about careers. Gather students' input on sharing and using the survey data. Include students in the planning process. Report findings to students and explain how they will be used for improving programs.

Communicating with Campus Groups about Data Collection

Continued

Institutional Research Office	Collaborate to avoid multiple or overlapping surveys on PhD career pathways information. Explore ways to integrate survey questions into existing data collection efforts. Review schedules to avoid competing with other surveys. Collaborate on plans for archiving, analyzing, and sharing data.
Alumni Office	Explore ways that PhD career data could enhance the activities of the alumni office. Collaborate on assembling alumni contact information. Ask what is already known about PhD alumni career pathways. Avoid competing with other alumni surveys.
Career Office	Explore ways PhD career data could enhance the activities of the career office. Ask what is already known about PhD student and alumni career pathways. Avoid competing with other student or alumni surveys.

Graduate schools should also engage PhD students themselves. Asking PhD students for their input on career preparation while they are still enrolled in graduate school not only sends the message that the institution values and supports their careers; it also helps students establish a habit of responding to requests for information from the graduate school. One way of accomplishing this is by accompanying the student survey with an annual letter from the graduate dean.

IMPORTANT: Any survey should follow institutional protocols for human subjects protections. Avoid linking calls for information about career aspirations to annual student progress reports, which may signal that students are being evaluated on the basis of their career aspirations. This could bias student responses.

Tactics for Survey Implementation

As part of our effort to support institutions collecting PhD career pathway data, CGS facilitated regular discussions with universities about their processes for implementing the survey. Below we highlight several important strategies for getting the survey off the ground. A critical step in this process is gathering up-to-date alumni contact information, which may live in different campus offices or be held by an Alumni Office with strict rules for sharing alumni contact information. Below we outline strategies that worked well at participating institutions.

Strategies for acquiring reliable alumni contact information and alumni engagement

- Gather data from alumni relations, the career center, and social media sites (e.g., LinkedIn and other resources) for current email addresses and places of employment for the alumni that are being surveyed.
- Invite the graduate school team and members of alumni relations to serve as active partners and collaborate on the effort to communicate with alumni about the project.
- Use an external vendor for assistance in locating alumni.
- Integrate career pathways survey items into existing alumni surveying efforts.
- Use an automated alumni email verification system to verify email.
- Provide updates to relevant campus groups through emails or newsletters.
- Ensure ongoing communication with doctoral graduates to build a stronger link to graduate alumni.
- Invite alumni to share their stories. On the Graduate School website and in newsletters, ask alumni to discuss their chosen career paths and join panels at campus events.

Once alumni contact information is collected, it's important to have a strategy for ensuring strong response rates. In the PhD Career pathways project, response rates ranged from 20% to 60% for participating universities.

Strategies for Increasing Response Rates

- Enlist the support of the graduate dean as well as academic deans. At some universities, these individuals assisted in contacting students and alumni and encouraged participation.
- Enlist the support of senior university leadership. For example, at one university, the Chancellor sent a letter to students along with a link to the survey, communicating that the institution values and supports their careers.
- When possible, contact students at a university account that persists post-graduation.
- To reduce survey fatigue, incorporate survey items on career pathways into an existing survey.

Developing a Strategy for Using the Data and Resulting Findings

How an institution chooses to use the PhD career data will be determined by its answers to some of the planning questions outlined above. Throughout the PhD Career Pathways project, CGS heard that anonymized data generated by data collection efforts should be communicated to faculty soon after analysis to give them context for their teaching and mentoring work. The student survey is intended to provide immediate feedback for programs and enable them to make mid-course adjustments. For example, using information about student career aspirations, programs might be able to change the way they approach formal and informal conversations with graduate students about career preparation, and possibly recognize a need to expose students to a more diverse range of careers. Care must be taken, however, to protect students' anonymity, especially in small programs or for underrepresented groups.

Here are some examples of how participating institutions shared information with different groups:

- Developing interactive data dashboards and creating a Career Pathways database.
- Using program-level findings to begin a conversation with individual departments and programs.
- Holding a campus-wide event to promote collaboration around plans to improve graduate education.
- Sharing profiles of doctoral alumni online on social media.

It is important to note that sharing findings is not just about identifying room for improvement. Findings are also opportunities to share the successes of individual departments and programs and alumni pursuing diverse careers. Below we provide two approaches to data-sharing at partner universities.

The University of Virginia: *PhD Plus*

At the University of Virginia, the CGS Career Pathways Project was integrated within a larger institutional emphasis on data-informed decision-making, and specifically within the design and development of *PhD Plus*, the university-wide program to enhance career and professional development for all PhD students. The goal of PhD Plus is to enhance the career and professional development of all PhD students at the University of Virginia through the following three mechanisms: 1) by providing access to career counseling and resources that guide the formation of career choices early in students' programs; 2) by providing access to targeted training focused on the development of core competencies shown to be important for the development of specific careers; and 3) by providing access to new forms of experiential learning opportunities.

The data collected over the course of the project directly supported PhD Plus by providing career counselors with data on the spectrum of careers that UVA PhD graduates were currently engaged in; informing program designers of the competencies and areas of training that both current PhD students and PhD alumni report as being most important; and serving to reconnect the University with PhD alumni who may be in a position to mentor and/or host students who are interested in similar careers for experiential learning opportunities.

Data resulting from both the survey of current students and PhD alumni were shared with administrators in all relevant schools. Associate Deans and Directors of Graduate Education in each of these areas were included in communications about the program. Moreover, regular updates were provided on the progress of the project through the University-wide Graduate Affairs Network—a group of roughly 60 administrators from across the University who are engaged in graduate education in various ways. Given that the project incorporates every PhD program from across the University, there is an opportunity to promote the use of project data in annual, or regular, program reviews that generally occur within the schools.

University of California System—Creation of a Data Dashboard

The University of California (UC) incorporated the CGS Career Pathways alumni and student surveys into a strong systemwide infrastructure of institutional research, which has enhanced tracking, reporting, and communication about UC PhD program characteristics and outcomes. The PhD alumni survey data were incorporated into a ***dashboard on employment and doctoral experience*** that allows prospective students and the public to view results by campus, department, and cohort. In addition, ***basic career outcomes data*** have been included as part of the doctoral program data dashboard.

The dashboard on employment and doctoral experience also informed a day-long workshop on careers for doctoral alumni in the Humanities (***UC Humanists@Work***) as well as follow-up work with alumni focus groups.

Potential Domains of Program Improvement

How an institution uses data resulting from their research will depend on the data they collect and what those data say about individual programs. We encourage institutions to consider four areas in particular when using data for the purpose of program improvement: expanding definitions of career success, program review, improving career services, and supporting mentoring. We provide several examples below of PhD Career Pathways institutions that used survey data in these domains.

Of course, students may have career preparation and professional development experiences that are not delivered by the program. For example, career services are typically situated in an office outside of the student's program of study. While improvements to career services is not necessarily an aspect of "program improvement," we encourage universities to use resulting data to improve services to PhD students regardless of where on campus they are offered.

Expanding Definitions of Career Success

Data on PhD career aspirations and pathways have the potential to help programs articulate expanded yet program-specific views of career pathways on websites, and in coursework, student materials, mentoring conversations, and other program-related activities. Additional strategy ideas can be taken from CGS's previous project, ***Promising Practices in Humanities PhD Professional Development*** (McCarthy, 2017,) the American Council for Learned Society's assessment of impacts of the Mellon/ACLS Public Fellows program (ACLS, 2024,) and from the National Institutes of Health's Broadening Experiences in Scientific Training project's ***publications***.

Described above, the data communication strategies of UVA and the University of California systems help expand definitions of career success: publicizing the employment outcomes of PhD alumni in a broad range of workforce sectors makes these careers visible. Doctoral programs can further support this strategy by expanding the ways in which they report the career outcomes of PhD alumni. While some programs continue to publish "PhD placements," it is increasingly common for programs to report on the career outcomes of alumni pursuing a wide variety of jobs post-graduation.

Program Review

Whatever your institution's review cycle, having the most recent data available for analysis and discussion will be valuable. In developing plans to use data in program review processes, institutions are encouraged to give particular consideration to how data might be used to make program improvements in areas determined to be high-priority by project participants. These might include: plans for encouraging departments to better define and support definitions of career success; using data to improve curricula and professional development opportunities offered by the program; strengthening or expanding mentoring structures; defining and clarifying program mission; and improving or supplementing career services offered by programs. The following example from the University of Arizona incorporates data into the program review process.

University of Arizona—Graduate Handbooks and Academic Program Reviews

To ensure that data collection for program improvement is sustainable, the University of Arizona (UA) incorporated their project findings into institutional processes for assessment. Because most students rely heavily on graduate handbooks for expectations and information, the University used its career pathways data to improve their usefulness to students. With the Provost's support, programs undergoing Academic Program Reviews (APRs) must have their handbook approved by the Graduate College. Given successful survey practices and analysis resulting from the CGS Pathways project, the Graduate College now requires doctoral programs to provide career data in all handbooks. Handbooks also include links to mentoring plans that support career success in diverse employment sectors.

Another institutional change guided by the CGS Pathways project is the incorporation of graduate career outcomes in the 7-year Academic Program Review (APR) process. The APR manual requires units to report findings from annual Individual Development Plan conversations between graduate advisors and their mentees who discuss, among other topics, support for employment goals in multiple sectors. Units are asked to analyze annual surveys of current graduate students regarding their professional development needs and annual surveys of alumni regarding their career trajectories and professional development skills that have been important to their success. By connecting the data to APRs, the university encourages faculty to support broad conceptions of successful employment to include careers in the business, non-profit, and government sectors. The office of the Vice Provost for Academic Affairs works with programs undergoing APRs to use the data for improvement of curricula, professional development, mentoring, and career services.

Improving Career Services

Data on PhD career pathways can be invaluable to Career Services, which can use this information to organize and provide internships, career exploration opportunities, and job search resources. Career data can also be used to make the case for improving the opportunities available to graduate students through Career Services or similar offices. Some institutions participating in the CGS data collection effort added staff exclusively dedicated to advising graduate students on career options in their fields, including careers beyond the academy, as in the example below.

Arizona State University—Improving Career Services

Arizona State University used the CGS PhD Career Pathways data as a tool to identify and reach out to alumni who participated in the survey. At ASU, the Graduate College partnered with various units and services across ASU, such as Career Services and the Postdoctoral Affairs Office, to implement professional development activities and events. These partnerships are crucial to preparing doctoral students to define clear career aspirations and preparing them for multiple career pathways. For instance, Career Services houses the ASU Internship Professionals Network. The goals for this group are to (1) review national/international data around internships, (2) develop best practices for internships for those faculty/staff overseeing internship programs across the university, (3) hear directly from employers about what they are seeking from students related to their internship opportunities and what they are offering students in the way of skill development, and (4) review university resources/guidance related to internships. The Graduate College provided data to the Career Services team and particularly to the Internship Network so that they could use their tools (e.g., Handshake, a career platform) for organizing and providing internship, career exploration, and job search resources to current and former ASU students.

These efforts were complemented by strategic activities in the professional development portfolio, such as an initiative to connect graduate students with alumni working in industry. In one example, the university created panels of professionals with PhDs (e.g., postdoctoral fellows, advisory board members) from various disciplines to discuss their unique career paths and the value of earning a PhD in various industries. These discussions highlight career options available to PhDs inside and outside of academia and provide students with first-hand accounts of how the competencies and knowledge they are developing through their PhD program may be relevant to professional positions in various sectors. Graduate students were also matched with alumni in specific fields/occupations selected by students to engage in conversations about career pathways.

Supporting Mentoring

Developing connections to PhD alumni helps a university to offer a more diverse range of mentoring opportunities for current PhD students. As explained in the example below, the University of Notre Dame used career pathways data to expand outreach to PhD alumni in a variety of workforce sectors and invited them to support the institution's short-term mentoring program.

University of Notre Dame: Building Relationships between PhD Students and Alumni

The PhD Career Pathways project offered the university an opportunity to assess past and current training and enhance students' professional development and mentoring. Specifically, data from the project strengthened connections among alumni and the University as a whole. One such effort is the ***IrishCompass*** program administered by the Alumni Association, in which alumni take on short-term mentoring relationships with current students. As the number of alumni that remain actively connected to the university grows, the Graduate School will have greater access to alumni contact information, and increased survey participation. The career pathways data was used to expand outreach to alumni, which helped identify alumni for participation in the mentoring program.

Final Thoughts

As an institution develops a plan for using the data it will collect, it may also consider comparing its own data with larger trends at other graduate institutions. The next three chapters provide findings from the larger CGS dataset, which includes responses from approximately 25,000 doctoral alumni, to help contextualize institutional efforts.

3: Using National Data to Challenge Common Assumptions

This report began by identifying some of the unfounded myths about PhD education and careers. In this section, we identify three additional common beliefs or assumptions about PhD careers and place them in the context of aggregate data collected in the PhD Career Pathways project. The point is not to suggest that beliefs about PhD careers are never true for any individual, but to demonstrate that many beliefs need to be questioned in relation to available evidence, both at the national and institutional level.

A. Career Pathways of Future Faculty[2]

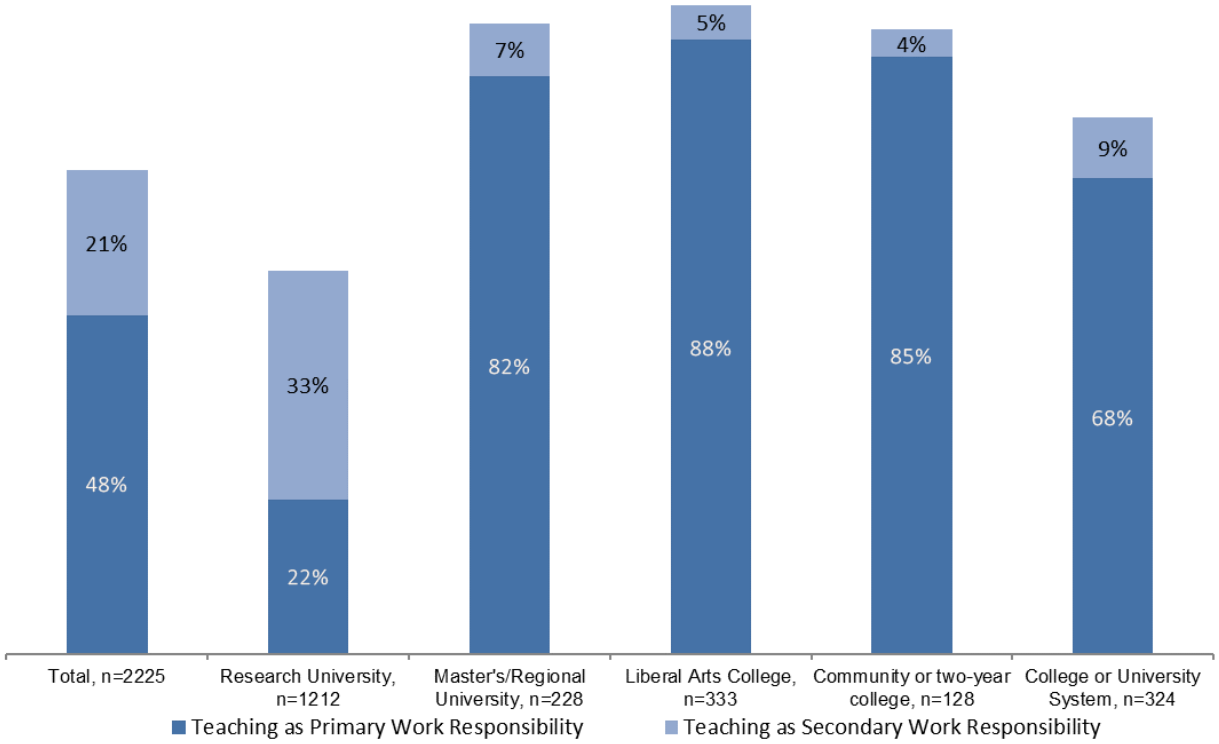
Assumption: Students go on to teach and conduct research at universities like the one where they completed their PhD.

According to the National Science Foundation's (NSF) National Survey of College Graduates, 46% of doctoral degree holders employed in 2023 worked for colleges and universities in some capacity. For 65% of the PhDs employed by colleges and universities, teaching was their primary or secondary work activity (NSF, 2023). In fact, 47.6% of the postsecondary teaching workforce, including those employed at community colleges, held a doctoral degree (Bureau of Labor Statistics, 2024). Though the vast majority of research doctorates are conferred by Research and Doctoral Research Universities, these institutions only make up 12% of degree-granting postsecondary institutions in the United States (National Center for Education Statistics [NCES], 2023) and enroll about 35% of the approximately 15 million undergraduate students (NCES, 2023b). Survey data from the PhD Career Pathways project provides new insight into how PhDs feel about their preparation to work at different types of institutions.

In our analysis, a large share of PhDs working for "Research Universities" identified basic research as their primary responsibility; however, the majority (55%) also considered teaching as either an important primary or secondary responsibility. (**See Figure 2**). By contrast, the majority of PhDs who worked in non-research universities viewed teaching as their primary responsibility.

2 Part A, Section 3 is partially based on a brief prepared by Hironao Okahana and Timothy Kinoshita. Data presented in this section are based on the CGS PhD Career Pathways Project Fall 2017 Alumni Survey, which was distributed to doctoral degree recipients that were three, eight, or fifteen years out of their PhD in selected programs at 35 participating institutions. Each of the universities administered the survey individually and shared the resulting data with CGS. Included in the sample analyzed were 2,225 doctoral degree recipients who reported working for one of five postsecondary sectors (Research University, Master's/Region University, Liberal Arts College, Community or Two-Year College, and College or University System) in their current job and reported at least a primary work responsibility.

Figure 2: Teaching Work Responsibility Across Postsecondary Sector



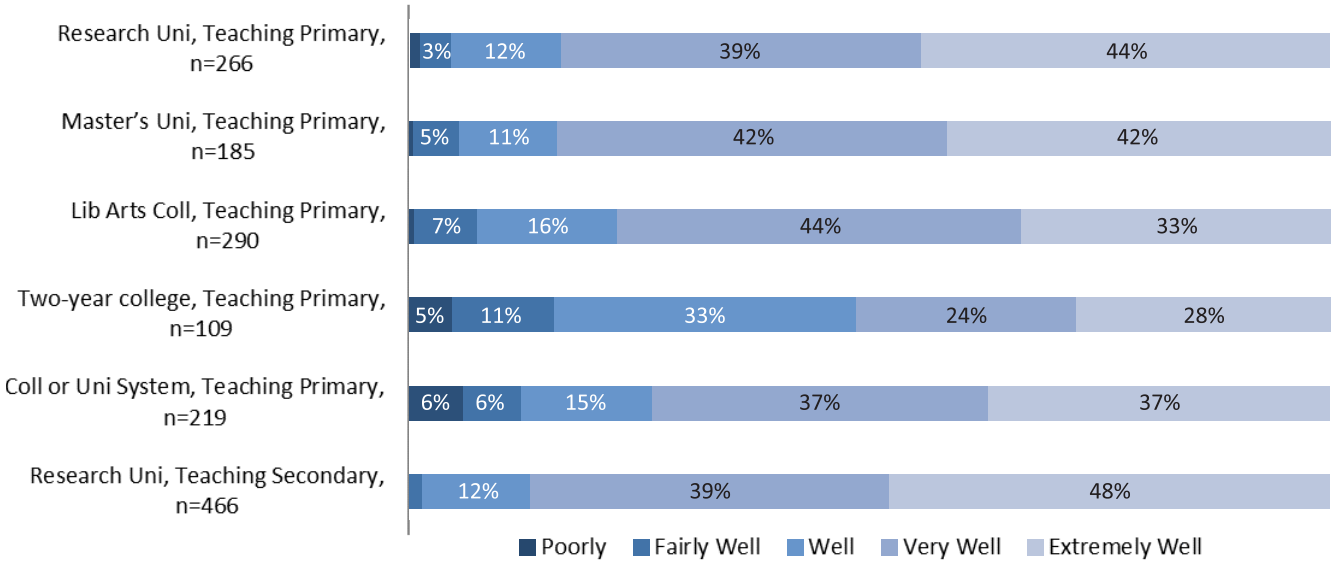
Council of Graduate Schools. (2018) Fall 2017 Alumni Survey of the Understanding PhD Career Pathways for Program Improvement Project (Restricted-use, Deidentifued Individual-Level Data File). Washington, DC: The Author.

[My graduate institution] actually has a teaching minor. I would not say that's nationwide. But again, it's a kind of on the students to be the one to seek out those opportunities rather than it being a required part of the program.

—Mika, Engineering, Higher Education

In general, those working outside of research institutions felt less prepared than those at universities where research is the focus. When asked how well their PhD prepared them for their current job at "Research Universities," 83% of those with primary teaching responsibilities and 87% of those with secondary teaching responsibilities responded, "Extremely Well" or "Very Well." In contrast, just over half of respondents working for "Community or Two-year Colleges" answered "Extremely Well" or "Very Well" to the same question. (**See Figure 3**)

Figure 3: Percent responding "Extremely Important" or "Very Important" to survey item "How important are each of the following attributes/skills in successfully performing your work in this job?"



Council of Graduate Schools. (2018) Fall 2017 Alumni Survey of the Understanding PhD Career Pathways for Program Improvement Project (Restricted-use, Deidentifued Individual-Level Data File). Washington, DC: The Author.

The findings point to potential opportunities for graduate schools and PhD programs to develop and offer resources and programming that prepare PhD students for careers in the "Community or Two-year College" sector.

Conversation Starters for Improving Preparation of Future Faculty:

- What kind of professional development opportunities does your institution provide PhD students to hone their teaching skills? What institution-wide resources, as well as department/program specific resources are available for PhD students?
- How effective are these opportunities? What types of feedback processes and/or assessment plans for these professional development programs does your institution and PhD programs have?
- What are your institution and PhD programs doing to foster partnerships with area state colleges, community colleges, and other institutions to create teaching opportunities for PhD students aspiring to faculty careers?

B. Job Changes of PhD Graduates after Earning Their Degree[3]

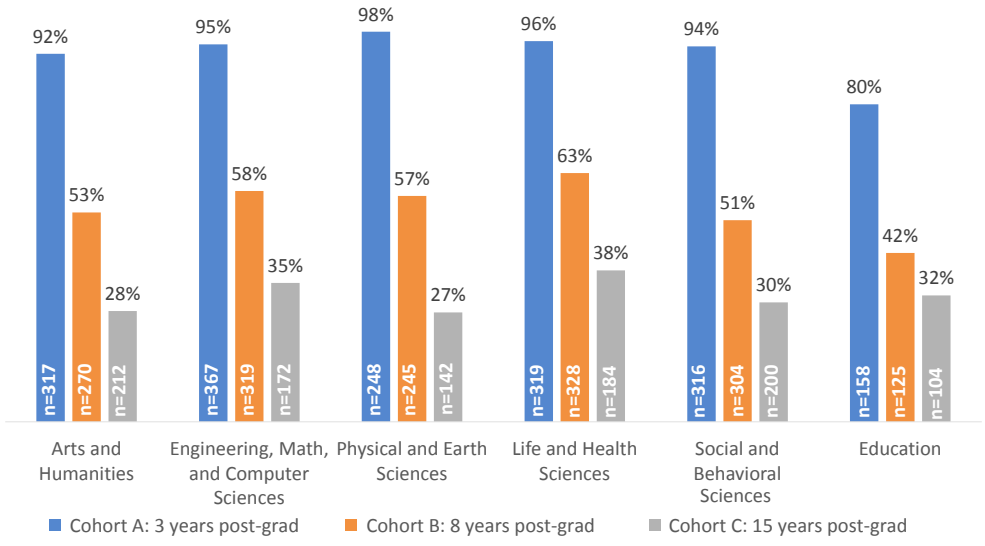
Assumption: Once you pick a career path post-PhD, you have to stick with it.

To date, relatively little has been known about the job transitions that PhD degree holders experience at various stages of their careers. Using data from the PhD Career Pathways project, we analyzed current and immediate prior jobs of PhD degree holders who earned their doctorates three years (Cohort A), eight years (Cohort B), and fifteen years (Cohort C) ago. We examined the nature of job transitions that occurred within the last three years.

Unsurprisingly, most respondents in Cohort A experienced job changes within the last three years. In every broad field of study except Education, over 90% of PhD alumni indicated that they switched to their current jobs within the last three years. In Education, only 80% in Cohort A indicated that they switched to their current jobs within the last three years, likely because some of them had already been employed in relevant jobs while pursuing a doctorate. (**See Figure 4**)

In contrast, fewer alumni in Cohorts B and C experienced recent job changes; approximately one-third of Cohort C reported that they started their current jobs within the last three years. Relative to other broad fields, the Life & Health Sciences saw higher rates of recent job changes in all three cohorts. (**See Figure 4**)

Figure 4: Share of Ph.D. Holders who Started Their Current Jobs within 3 Years by Cohort and Selected Broad Fields of Study



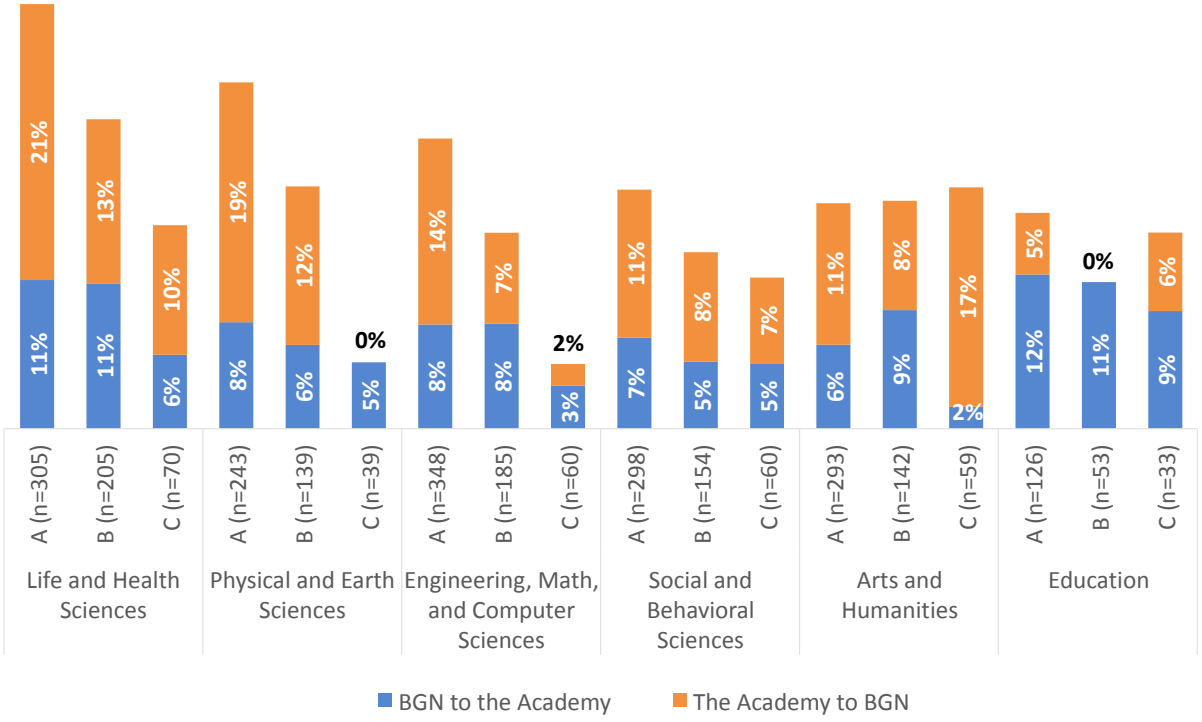
Data Source: Council of Graduate Schools, Understanding PhD Career Pathways for Program Improvement (NSF/DGE #1661272 and Mellon Foundation #31600612), Fall 2018 Alumni Survey.

3 Part B, Section 3 is partially based on a brief prepared by Hironao Okahana. Data presented in this section are based on the PhD Career Pathways Project Fall 2018 Alumni Survey, which was distributed to doctoral degree recipients that were three, eight, or fifteen years out of their PhD in selected programs at 51 participating institutions. This analysis is based upon 4,766 doctoral degree recipients who responded to the survey and reported their doctoral fields of study, current jobs, and immediate prior jobs. For the purpose of this analysis, "jobs in the academy" includes those who worked in one of five postsecondary sectors (Research University, Master's/Regional University, Liberal Arts College, Community or Two-Year College, and College or University System). Cohort A earned their doctorates between July 1, 2014 and June 30, 2015 (three-years out). Cohort B earned their doctorates between July 1, 2009 and June 30, 2010 (eight-years out). Cohort C earned their doctorates July 1, 2002 and June 30, 2003 (fifteen years out). In order to understand which of these cohorts were most likely to experience recent job changes, only job changes within the last three years were analyzed.

Most job changes occur within the same sectors; however, some PhD graduates move between sectors of employment. In STEM fields, most inter-sector job changes occur in the first three years post-graduation. For example, 32% of Life & Health Sciences PhDs, 27% of Physical & Earth Sciences PhDs, and 22% of Engineering, Mathematics & Computer Sciences PhDs in Cohort A moved between business, government, and non-profit sectors and the academy within the last three years. It is likely that many of these transitions are out of a postdoc. In Arts & Humanities, the movement between non-academic sectors and the academy happened rather consistently across different cohorts, ranging between 17-19%. (**See Figure 5**)

In the majority of cases, these movements are from the academy to business, non-profits and government, except for the PhDs in Education (all cohorts). The most non-academic to academic transitions occurred for PhDs in Education. (**See Figure 5**) PhDs in Physical & Earth Sciences and Engineering, and Mathematics, & Computer Sciences who were 15 years past graduation also saw a larger shift from non-academic sectors to the academy.

Figure 5: Share of Ph.D. Holders who Moved between the Academy and Business/Government/Non-profit (BGN) Sectors in the Most Recent Changes of Their Jobs by Selected Broad Fields of Study and Cohort



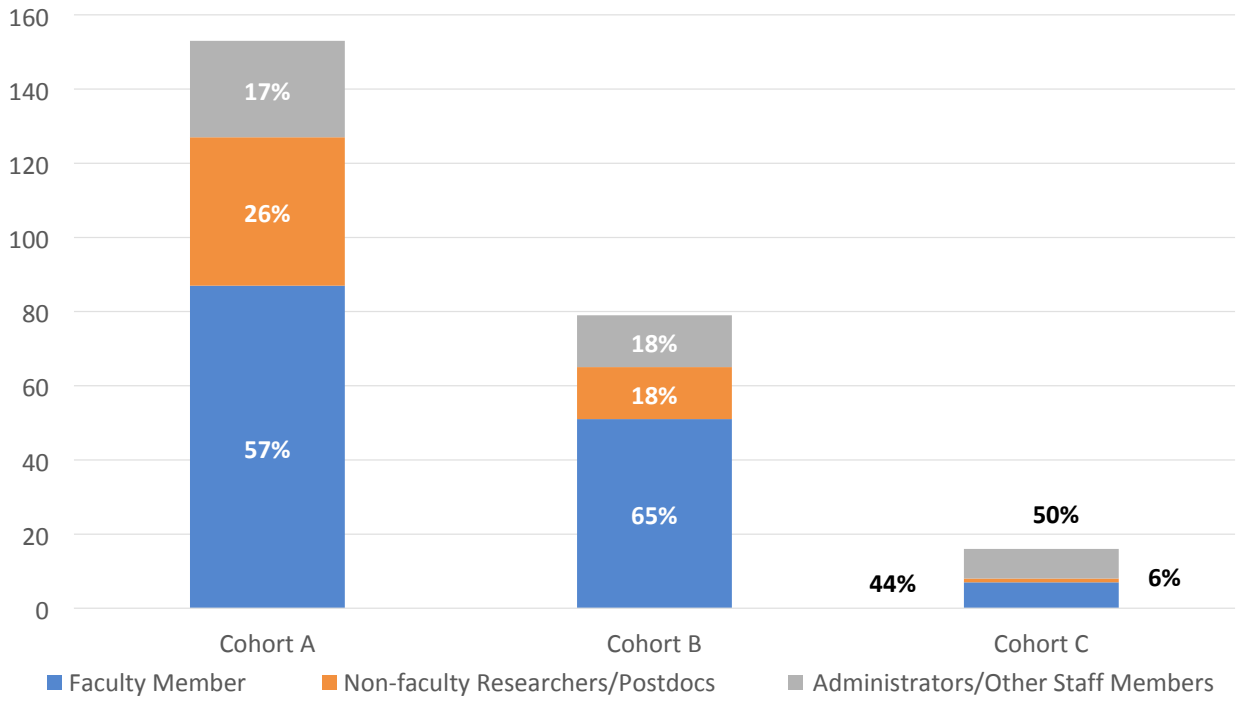
Data Source: Council of Graduate Schools, Understanding PhD Career Pathways for Program Improvement (NSF/DGE #1661272 and Mellon Foundation #31600612), Fall 2018 Alumni Survey.

Although most recent movements from non-academic sectors to the academy occur in Cohort A, the majority of those in both Cohorts A and B moved into faculty positions. In contrast, among those who made a change, those in Cohort C were slightly more likely to move into administration positions, rather than faculty jobs. (**See Figure 6**)

The main takeaway here is that many PhD holders experience job changes in their early careers and even into mid-career. This finding may reflect the effects of postdoctoral training opportunities in some fields, but it also signals that earning a PhD is just the beginning of one's career, and job changes continue throughout the next 15 years in the workforce. In other words, a first job is certainly not the last job. This underscores the importance of preparing PhD students not only for their first job searches but also for preparing them to navigate different job opportunities and careers as a whole.

It is also important to emphasize that movements between non-academic sectors and academia are not unidirectional. There are PhD holders who move from business, non-profit and government to the academy in the beginning, early, and mid phases of their careers. Once again, this underscores that there is no singular pathway to faculty and administrative positions at colleges and universities, even if this movement is more pronounced in some fields than in others.

Figure 6: Share of Ph.D. Holders who Moved from BGN Sectors to the Academy by Cohort and Current Job Types



Data Source: Council of Graduate Schools, Understanding PhD Career Pathways for Program Improvement (NSF/DGE #1661272 and Mellon Foundation #31600612), Fall 2018 Alumni Survey.

Conversation Starters for Supporting Lifelong Learning and Career Transitions:

- What kind of professional development opportunities does your institution provide PhD students to help them imagine and navigate into their second jobs and beyond?
- What kind of resources and guidance does your institution offer to faculty members and advisors, so that they talk to their students about a range of job opportunities and career pathways for PhD holders?
- How does your institution's Preparing Future Faculty (or similar) program address and help PhD students consider multiple pathways into the professoriate?
- Are there opportunities for PhD holders with experience outside of the academy to contribute to your university's activities in their early and mid career stages and beyond?

C. Skill Requirements for Different Job Sectors

Assumption: Only those seeking jobs outside of academia require professional development.

Professional development opportunities during PhD study are key to many career trajectories (Nerad, 2015; Sharmini & Spronken-Smith, 2020). Beyond coursework and the dissertation, structured experiences such as internships, conferences, workshops, and experiences abroad provide skill development opportunities for work in academia, business, government, and non-profits. However, as many colleges and universities face cutbacks, graduate schools are less certain about the availability of these opportunities and supporting them may not be the highest priority in the face of other pressing challenges (Okahana, 2020). Graduate schools and programs need to identify and prioritize how they might deploy scarce resources. Data from the PhD Career Pathways project offers insights into the perceptions of PhD alumni regarding the timing and usefulness of professional development opportunities.

A Wide Range of Valued Skills

Overall, PhD alumni found 17 different professional development opportunities as useful. The opportunities that alumni most frequently marked as useful to their current jobs include: communication (95.8%), public speaking (93.6%), networking (91.3%), and digital literacy (90.9%). This was true for both those PhDs working as faculty members, as well as those who were not. Fewer PhD alumni noted that entrepreneurship, international travel seminars, and study abroad were useful for their current employment. (**See Figure 7**)

[A TA position] definitely helped with my speaking skills because I had to teach classes that had like 300 people. […] I definitely got over my fear of speaking in front of people, which helped me for presentations and then later. Now it seems like talking in front of other people doesn't scare me at all. […] I think that helps me as a manager, or if I'm working with someone and trying to explain something to them, I think I'm a lot better at doing that because of teaching.

—Nayeli, Social Science, Industry

Project Management and Entrepreneurship Emphasis for Non-Faculty

When examining differences between faculty (N=1,677) and non-faculty (N=2,191), it came as no surprise that more faculty found academic writing, teaching preparation, and grant writing useful. More faculty also found international experiences, including research and study abroad, as useful. Interestingly, non-faculty viewed project management and entrepreneurship as more useful than did faculty. (**See Figure 8**).

Despite these findings, it is important to note that non-faculty also placed high value on grant writing, with about two-third of this group indicating it as important. The importance of grant-writing as a professional skill for PhDs is also explored in Chapter 4, part B.

Figure 7: Usefulness of Professional Development

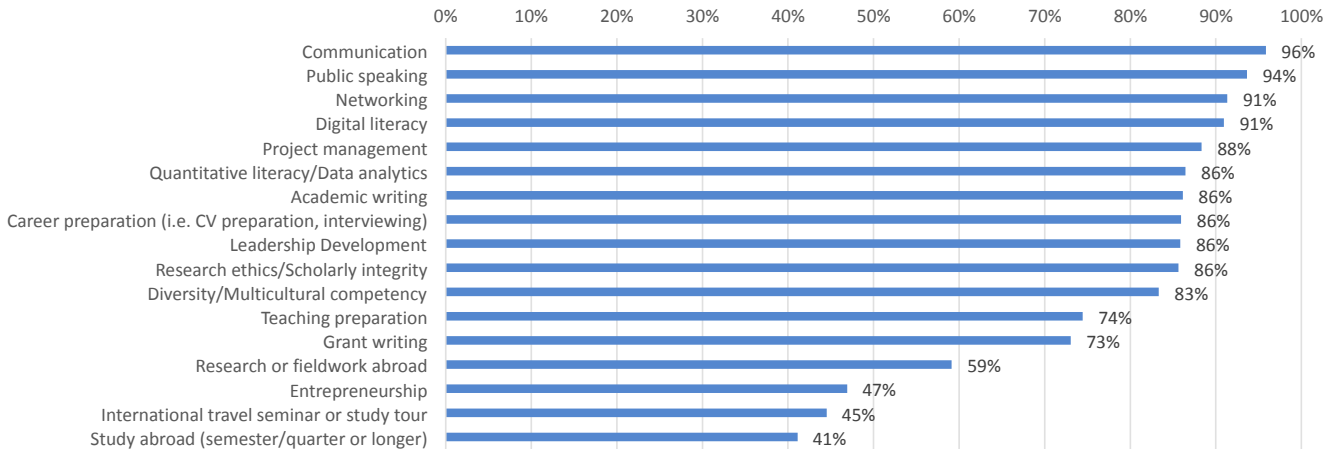
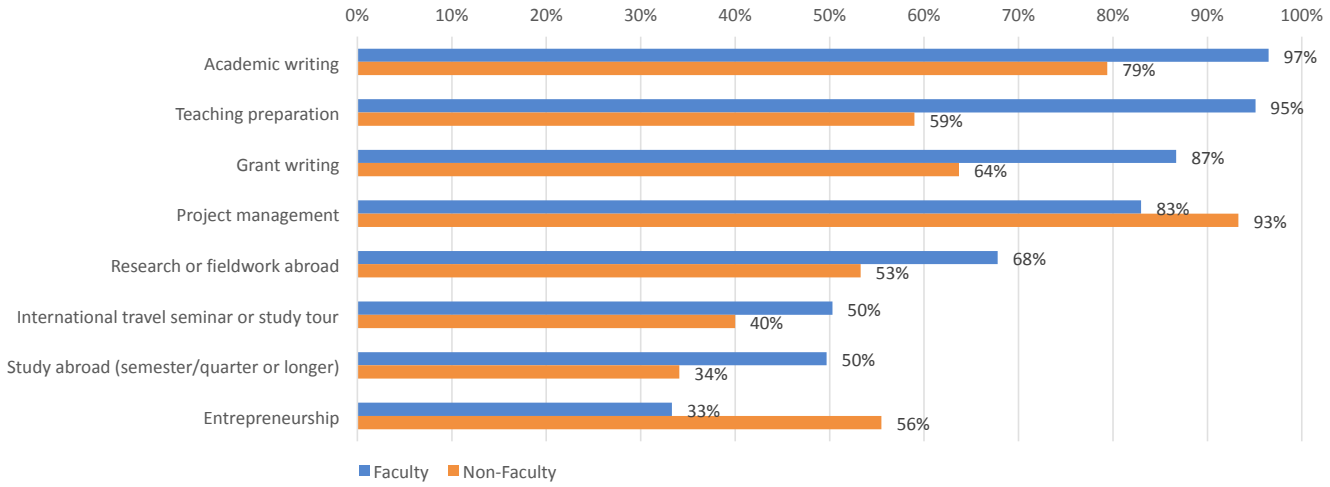


Figure 8: Usefulness: Differences between Faculty and Non-Faculty



An Early Start

Across nearly all professional development opportunities found to be useful, PhD alumni noted that earlier in the doctoral program was the most ideal timing, particularly for diversity/multicultural competency (84.9%) and digital literacy (83.0%). Notable exceptions were resume/CV writing and interview preparation (61.6%), entrepreneurship (41.4%), and leadership development (35.0%,) which were considered ideal toward the latter stages of the program. (**See Figure 9**)

Figure 9: Of the professional development opportunities that you believe are (or would have been) useful for your current position, when during the doctoral journey do you believe is the best time to receive such opportunities?

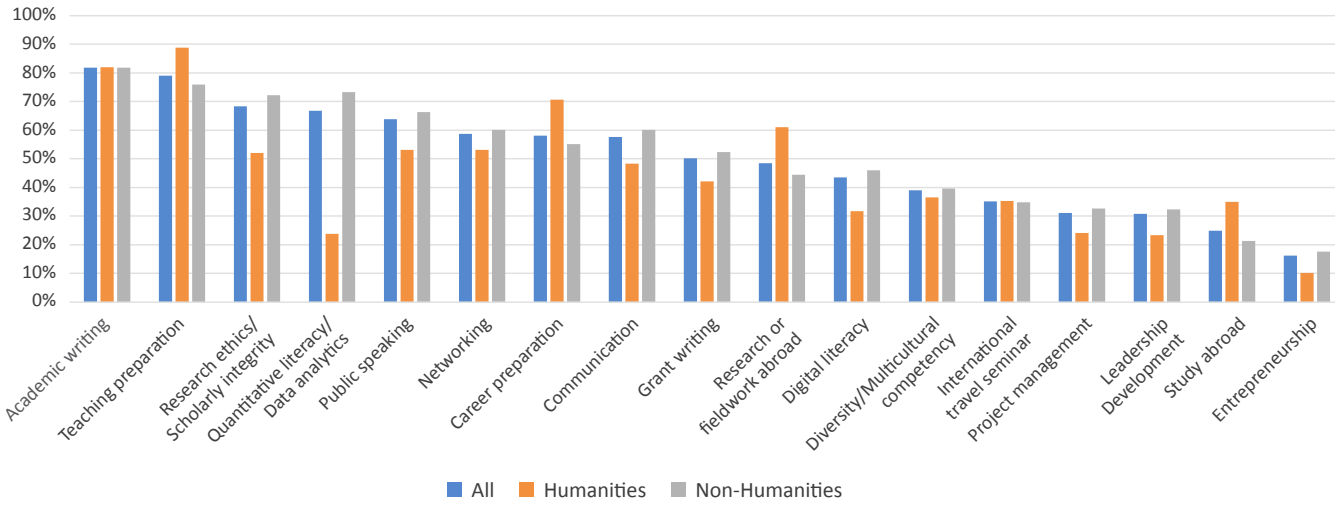
	Beginning	Middle	Latter Stages	After Doctoral Program
Communication	73%	19%	7%	1%
Public speaking	58%	31%	10%	1%
Networking	33%	31%	32%	4%
Digital literacy	83%	12%	4%	2%
Project management	30%	36%	24%	11%
Quantitative literacy/Data analytics	73%	21%	4%	3%
Academic writing	71%	23%	6%	0%
Career preparation (i.e. CV preparation, interviewing)	11%	25%	62%	2%
Leadership Development	18%	33%	35%	14%
Research ethics/Scholarly integrity	80%	16%	4%	1%
Diversity/Multicultural competency	85%	9%	4%	3%
Teaching preparation	42%	36%	19%	3%
Grant writing	21%	40%	30%	9%
Research or fieldwork abroad	21%	43%	29%	8%
Entrepreneurship	14%	22%	41%	23%
International travel seminar or study tour	26%	42%	23%	8%
Study abroad (semester/quarter or longer)	34%	39%	21%	6%

Professional development opportunities with more than one category highlighted in blue indicate a statistical tie for most popular response.

Mixed Levels of Participation

Among the opportunities found to be most useful, PhD alumni had varying levels of participation: public speaking (63.8%), networking (58.7%), communication (57.7%), and digital literacy (43.5%). Conversely, PhD alumni reported participating in academic writing (81.8%) and teaching preparation (79.1%) opportunities at higher levels. Stark differences, however, appeared when examining the Humanities (N=813) and non-Humanities (N=3,318) subsamples. Humanities alumni were more likely to have participated in teaching preparation, career preparation, fieldwork and study abroad. By contrast, non-Humanities alumni were more likely to have taken part in communication, public speaking, digital literacy, research ethics, and grant writing.[4] (**See Figure 10**)

Figure 10: Professional Development Participation: Humanities vs. Non-Humanities

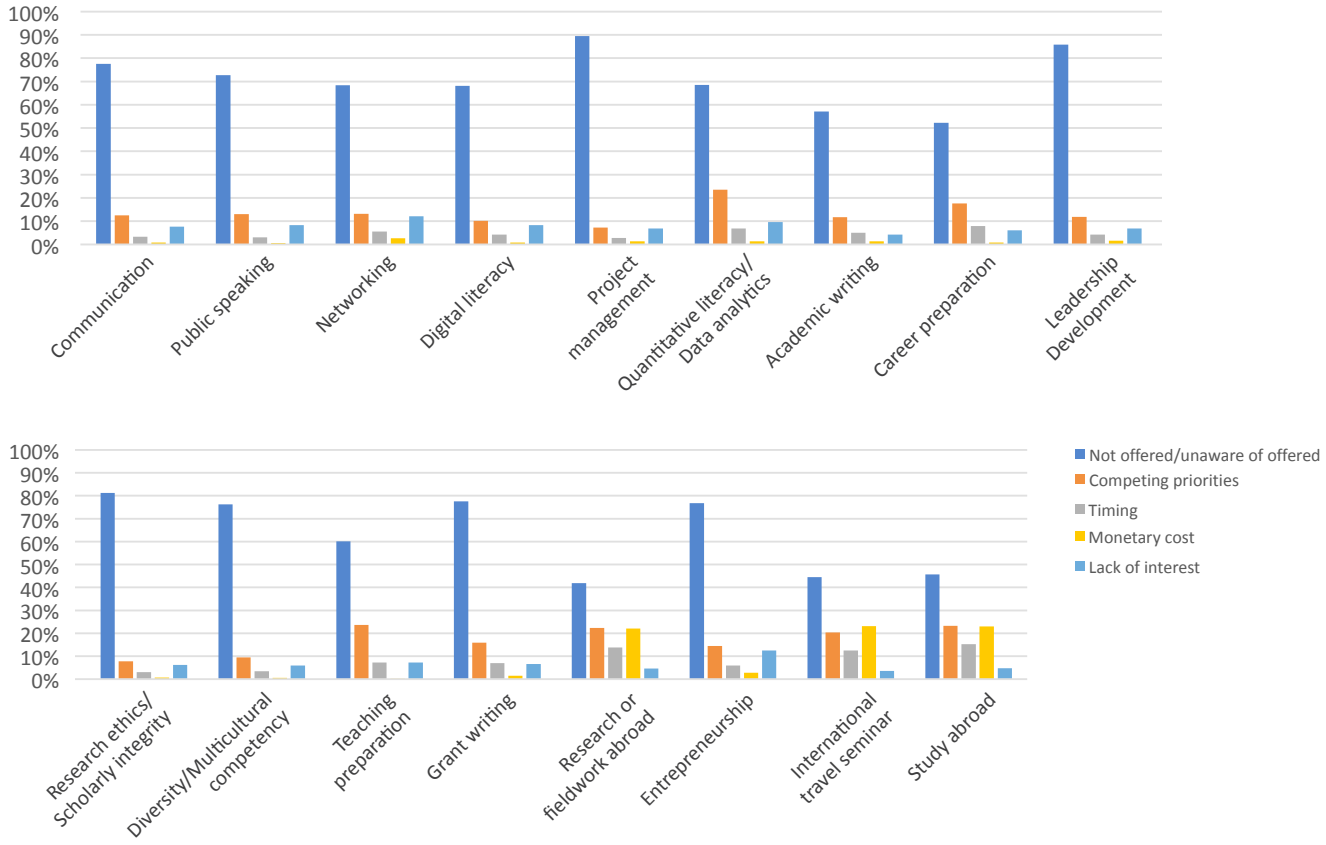


Barriers to Participation

For those who reported not participating in development they deemed useful, approximately 70% noted that such opportunities were not offered, or that they were unaware of such offerings as a student. Notably, 12.1% reported a lack of interest in networking. For international experiences, although a majority reported that these opportunities were available, competing priorities, timing, and cost were given as reasons for not participating. (**See Figure 11**)

4 These percentages represent the portion of alumni who previously participated in each PD opportunity of those who found such opportunities useful.

Figure 11: Reasons for Not Participating in Professional Development Opportunities



Most Useful Skill Areas

Four skill areas were most frequently cited as useful: communication, public speaking, networking, and digital literacy. There was no statistical difference between Humanities and non-Humanities PhDs in reporting usefulness. In the four areas of professional development determined to be the most useful, Humanities PhDs reportedly participated less than non-Humanities counterparts in the survey sample. Overwhelmingly, all non-participants cited "not offered/ unaware of offered" as the primary reason for non-participation while pursuing their PhDs.

More Humanities PhDs found "Diversity and multicultural competency" training to be useful than their non-Humanities PhD counterparts; however, only 37% of them took part in formal training opportunities while pursuing their PhD.

The majority of respondents suggested that professional development opportunities would be most useful in the beginning stages of the PhD. The one exception is networking, which respondents believed had high utility at all stages of doctoral study.

Focusing on early-stage professional development opportunities in communication, public speaking, and digital literacy, as well as professional development opportunities in networking throughout the PhD journey, may be an effective approach for graduate schools. However, a concerted effort should be made for promoting the programs, so that PhD students in Humanities become more aware of resources that may be helpful to them. As noted in chapter 4, it is important to consider the language used to advertise professional development opportunities to humanists in PhD programs, as not all terms will carry the same valence or positive association.

Conversation Starters for Improving Professional Development Opportunities

- What kind of professional development opportunities do your institution and graduate programs offer to PhD students?
- How are professional development opportunities promoted to PhD students early in their program? Specifically, are students encouraged by graduate programs and faculty to participate in professional development opportunities during the summer, when they may have fewer academic and teaching responsibilities?
- While academic conferences are excellent opportunities for communication, public speaking, and networking, conferences are expensive in both actual (e.g. registration fees, travel, lodging) and opportunity costs (taking time off of work, family responsibilities). How can your institution help provide similar professional development on campus?
- Are there opportunities to integrate Individual Development Plans (IDPs) into mentoring practices and professional development activities?

4: Closing Gaps in Knowledge: The Humanities

[…]there was a specific type of class that I ended up teaching, which is a writing and composition style class. And so to teach that, you had to take another pedagogy course. And it was incredibly valuable. I think, especially, I would not have gotten this particular job if I could not have come in saying convincingly, 'This is how I teach.' […] You could tell the difference between someone who is like, 'Here's my amazing class with all of my shiny ideas,' and, 'Here's a class that actually works' […].

—Issac, Humanities, Higher Education

The value of the Humanities PhD has been the focus of sustained discussion and debate over the past several decades. A reduction in tenure-track Humanities positions, combined with less established routes for humanists into other career sectors, has led to negative media articles about the value of Humanities PhDs and broader questions about the value of the degree. As with STEM fields, however, we must challenge the notion that there are "no jobs" for Humanities PhDs. This view— which normally refers to limited numbers of academic jobs—is often put forward in contexts where little is known about the variety of jobs in the business, government and non-profit sectors, in addition to positions in academic administration, that Humanities PhDs pursue. The decision of some universities to cut Humanities programs or significantly limit cohort size in doctoral programs makes it more important than ever to understand the career outcomes of Humanities PhD graduates.

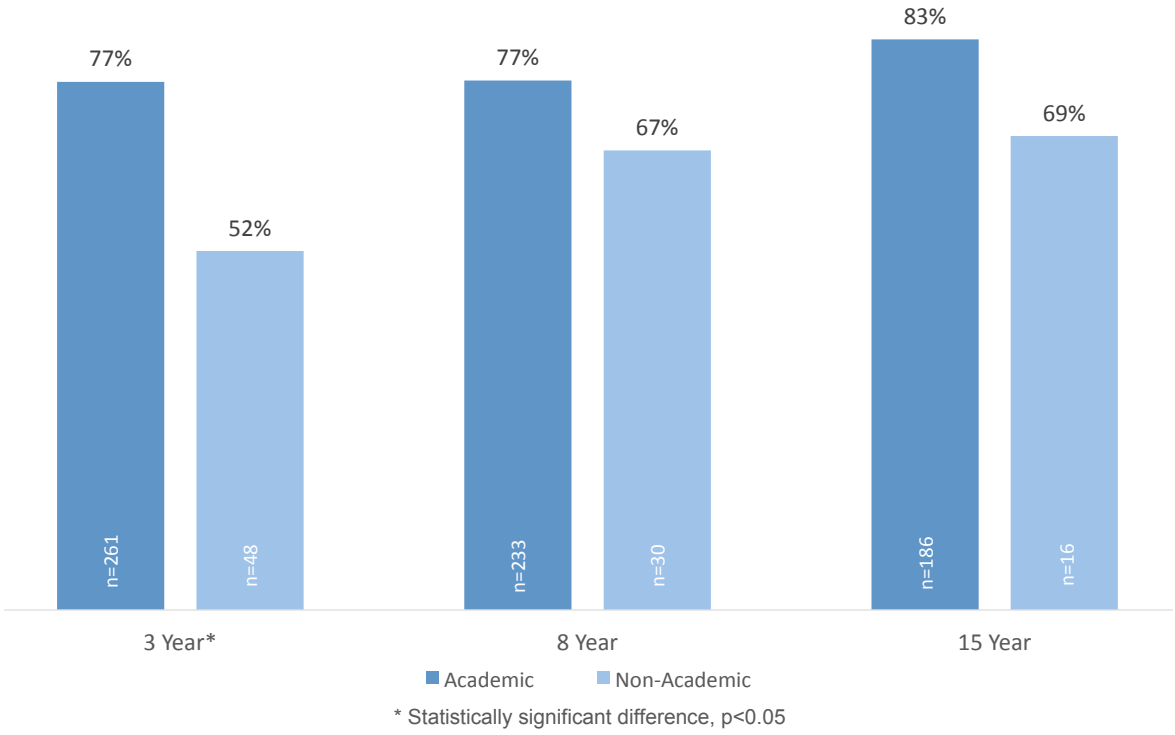
In this chapter we summarize findings from PhD graduates in the Humanities. The good news is that humanists report high satisfaction with their PhDs eight and fifteen years post-graduation. This is tempered by the fact that humanists take more time than their peers in other fields to realize the rewards of their training, information that graduate schools can use to improve career readiness and professional development for a range of careers.

A. How Well Did a Humanities PhD Prepare Them?[5]

According to PhD Career Pathways data, the vast majority of Humanities PhDs still work in fields related to their doctoral education and are satisfied with their jobs. According to the National Survey of College Graduates by the NSF, 90% of Humanities PhDs working in 2023 held jobs that are closely or somewhat related to their PhDs (NSF, 2023). Furthermore, 87% of graduates who are employed in art and humanities occupations are satisfied or very satisfied with their current work. This percentage is consistent for the 90% who work in related fields as well as the 10% who work in fields unrelated to their Humanities PhD degrees (NSF, 2023). Though these national data tell us about the current jobs of Humanities PhDs, little is known about their views on their PhD training. Using survey data from the Council of Graduate Schools' (CGS) *PhD Career Pathways* project, we developed new insights into how Humanities PhDs apply their doctoral training in the workforce.

A large majority of survey respondents believe that their Humanities PhD education prepared them well for their jobs. Although the differences were not statistically significant, Humanities PhDs who were employed by colleges and universities generally felt that their doctoral studies had better prepared them for their current job than those who were employed elsewhere. The difference was statistically significant only among those who were only three years post-graduation. (**See Figure 12**)

Figure 12: Percent responding "Extremely Well" or "Very Well" to survey item "How well did your PhD prepare you for [your current] job?"

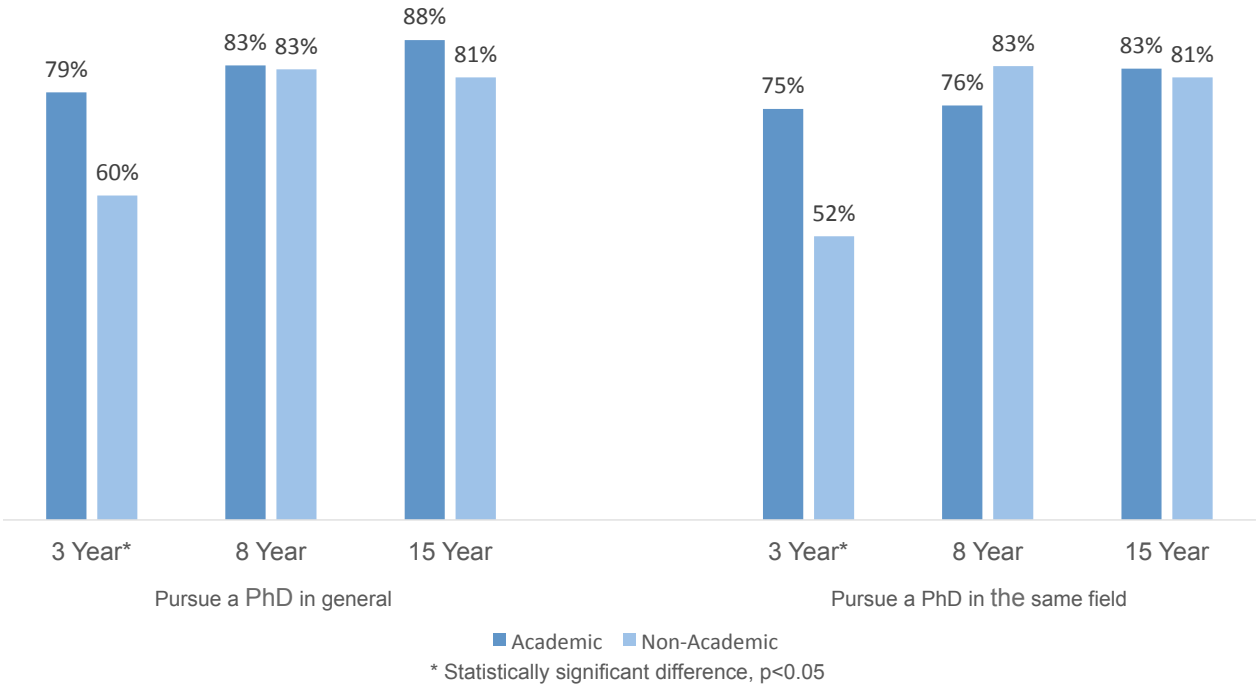


Source: Council of Graduate Schools, Understanding PhD Career Pathways for Program Improvement Project, Fall 2017 Alumni Survey

5 Part A, Section 4 is partially based on a brief prepared by Hironao Okahana and Timothy Kinoshita. Data presented in this section are based on the PhD Career Pathways Project Fall 2017 Alumni Survey, which was distributed to doctoral degree recipients that were three, eight, or fifteen years out of their PhD in selected programs at 35 institutions. The sample included 882 doctoral degree recipients in Humanities fields (Anthropology and Archeology, English Language and Literature, Foreign Language and Literature, History, Philosophy, Religion and Theology, and Arts and Humanities--Other). The analysis focused on Humanities PhD alumni who worked in jobs closely or somewhat related to their PhDs as of October 1, 2017. Those Humanities PhDs employed in unrelated fields accounted for only 60 respondents.

A large majority of survey respondents said that they would pursue a PhD in general or in the same field if they had to start over again. Humanities PhDs three years post-graduation and working for employers other than colleges and universities were less likely than their academic counterparts to say that they "definitely would" or "probably would" pursue a PhD in general or in the same field. However, when comparing employees of academic institutions and those employed elsewhere, for those eight and fifteen years post-graduation, the differences were not statistically significant. (**See Figure 13**)

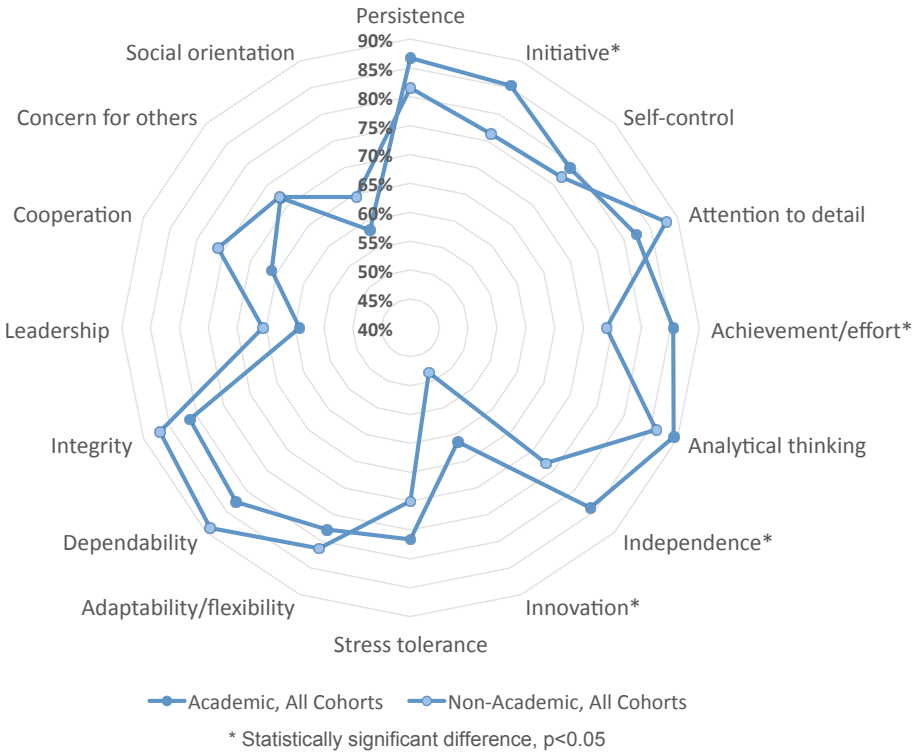
Figure 13: Percent responding "Definitely Would" or "Probably Would" to survey item "Given the perspective that you have gained since completing your PhD, if you had to start again, how likely would you do the following?"



Source: Council of Graduate Schools, Understanding PhD Career Pathways for Program Improvement Project, Fall 2017 Alumni Survey

Between Humanities PhDs working in academia and elsewhere, there are more similarities than differences in key workforce skills and attributes. While alumni in academic and non-academic sectors stressed different types of skills, there were few statistically significant differences for the twelve skills and attributes mentioned in the survey. (**See Figure 14**).

Figure 14: Percent responding "Extremely Important" or "Very Important" to survey item "How important are each of the following attributes/skills in successfully performing your work in this job?"



Source: Council of Graduate Schools, Understanding PhD Career Pathways for Program Improvement Project, Fall 2017 Alumni Survey

Together, these results suggest that Humanities PhD education offers relevant training that prepares graduates for jobs both inside and outside of the academy. Another implication is that those working in BGN sectors are, like their academic counterparts, using "intellectual" skills in their jobs. Programs and graduate schools are encouraged to continue to offer curricular and co-curricular experiences that integrate training and professional development opportunities toward a variety of rewarding career paths.

For those employed in business, non-profit, government and other sectors, it may take longer to recognize the value and relevance of PhD training to careers. Recent graduates may also be reconciling their initial expectations for a first job and career (e.g., becoming a faculty member at a research university) with their actual employment (e.g., employed in another academic or non-academic context). Support for transitions into first jobs may be particularly helpful for recent or soon-to-be graduates.

The value of a Humanities PhD might not be immediately tangible to employers outside of the academy (Cumerma, 2017). It is important for universities to engage employers as partners, helping them to understand the skills and knowledge Humanities PhDs offer to their sectors of employment (McCarthy, 2017). Developing connections to PhD alumni (who may also be employers) is equally important. The Mellon Foundation offers excellent examples of alumni stories in an article titled "***Where Can a Humanities PhD Take You?***" (Hueffner and Clift, January 2024). Similar newsletter articles or website posts can be developed at the university or program level.

Promising Practices:

In collaboration with the National Endowment for the Humanities (NEH), CGS established the Next Generation Humanities PhD Consortium, a collaborative learning community for 28 NEH Next Generation PhD grant awardees. Consortium participants sought to strengthen the career preparation of PhD students in the Humanities and resulted in ***Promising Practices in Humanities PhD Professional Development: Lessons Learned from the 2016-2017 Next Generation Humanities PhD Consortium***.

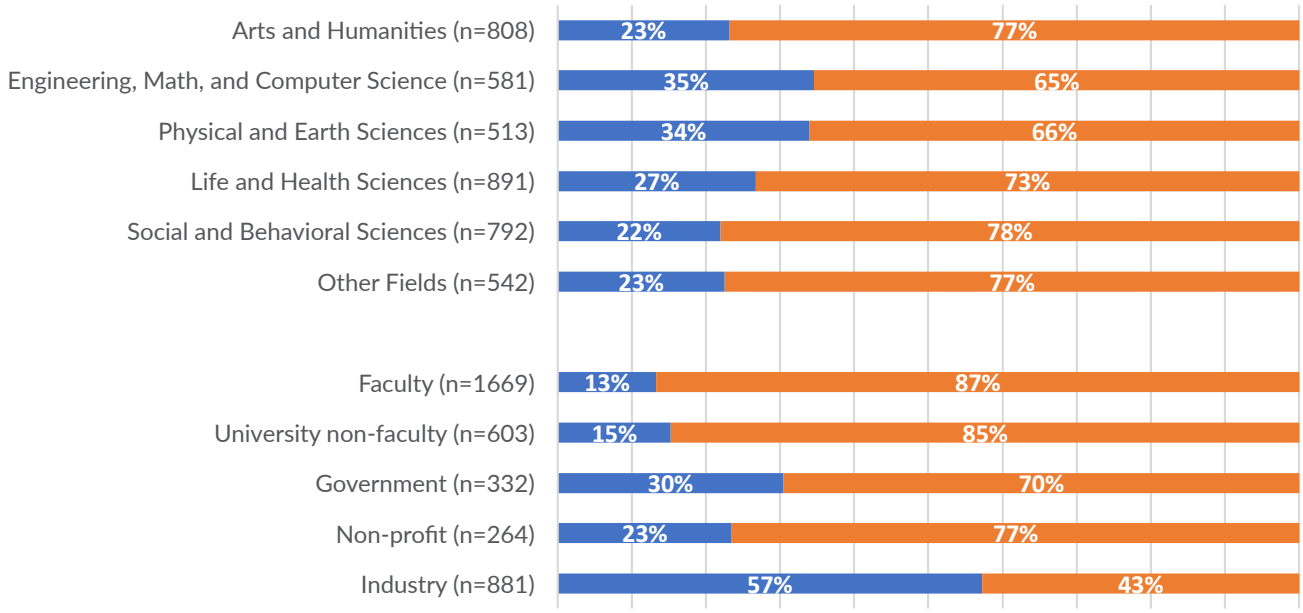
B. The Importance of Preparation in Grant Writing and Networking for PhDs[6]

Recent data show that, relative to other skills and attributes, grant writing is a skill that many PhD alumni across fields wish they had acquired (Mitic & Okahana, 2021). Opportunities such as grant writing experience help graduate students pursue funding and increase competence for the workforce (Nerad, 2015). According to Conn et al. (2016), grant writing allows PhDs to enhance research intentionality, project articulation, and overall writing skills. Data from the PhD Career Pathways offer insights into how PhD graduates view grant writing professional development opportunities.

Usefulness of Grant Writing

Within each broad PhD field of study, most PhD alumni found professional development in grant writing to be useful. **Figure 15** displays the percentage of participants by job type and discipline who indicated that grant writing skills were or were not useful in their current position.

Figure 15: Usefulness of Grant Writing Skills in Current Position



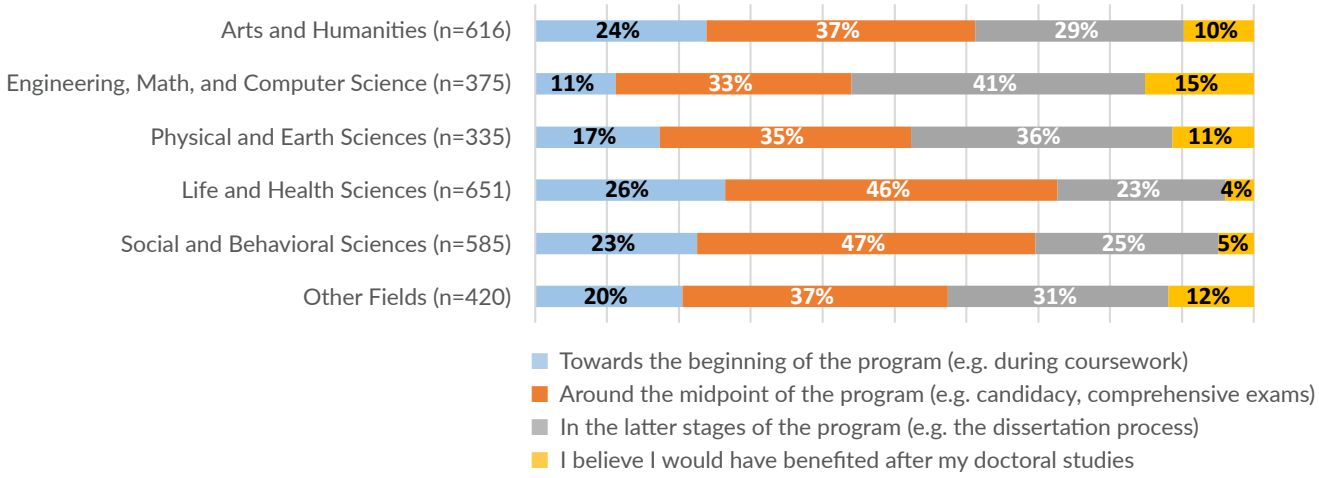
Data Source: Council of Graduate Schools, Understanding PhD Career Pathways for Program Improvement, Fall 2020 Follow-up Alumni Survey.

6 Part B, Section 4 is based on a brief prepared by Ahjah M. Johnson & Enyu Zhou. Data presented in this section are based on the PhD Career Pathways Project Alumni Follow-Up Survey, which was distributed in summer 2020 to doctoral degree recipients that were three, eight, or fifteen years out of their PhD in selected programs at participating institutions when they previously completed a baseline survey between 2017-2019. This analysis is based upon this aggregated data set, which includes 4,370 doctoral degree recipients from 58 institutions.

Timing for Grant Writing Preparation

Survey results show that the percentage of PhDs with Engineering, Math, & Computer Science (41%) and Physical & Earth Science (36%) degree fields preferred grant writing preparation to occur during the latter stages of the program (e.g., the dissertation process). The remaining fields indicated that this preparation should occur during the midpoint of their degree field (e.g. candidacy and comprehensive exams). Doctoral fellowships and research grant opportunities are typically available for PhD candidates. This interest in grant writing in the middle and later stages of the PhD coincides with students' eligibility to apply for grants and fellowships to fund doctoral studies as well as independent and group research. (**See Figure 16**).

Figure 16: Preferred Timing During PhD Experience for Grant Writing Professional Development



Data Source: Council of Graduate Schools, Understanding PhD Career Pathways for Program Improvement, Fall 2020 Follow-up Alumni Survey.

Barriers for Participation

Survey participants selected barriers that prevented them from participating in grant writing professional development opportunities during their degree program. Barriers included "Not Offered or Unaware," "Competing Priorities," "Timing," "Monetary Cost" and "Lack of Interest". Results were similar across all degree fields. "Not Offered or Unaware" had the highest percentage, at 71%, as one of the barriers to pursing grant writing. The remaining percentages include 15% for "Competing Priorities," 6% for "Timing," 1% for "Monetary Cost," and 6% for "Lack of Interest."

Increasing the awareness and access to grant writing professional development opportunities may remove the most important barriers to participation. When encouraging preparation in grant writing, universities should be explicit about the skills students will gain and how these can be applied across a variety of careers.

Promising Practices in Helping Humanists Develop Grant-Writing Skills

Building on the findings of the PhD Career Pathways project, CGS sought to expand the professional development of humanists in collaboration with CGS member universities. With funding from the Mellon Foundation, CGS established The Humanities Coalition, which seeded subgrants in two areas: grant-writing and resource development, and networking and relationship building. Examples of university projects in the area of ***grant-writing and resource development*** are available on the CGS website and summarized below; we encourage universities to consider these models in developing their own grant-writing programs for Humanities (and other) PhDs, which go beyond the conceptualization and writing of grants to include skills like funder identification, grants management, working collaboratively with communities to design grants that address their needs, and assessment and evaluation.

The University of Wisconsin-Madison

The University of Wisconsin (UW)–Madison Graduate School leads an annual Humanities Grant Writing Camp (HGWC) that trains Humanities PhD students in proposal planning, budgeting and writing for funders both within and beyond academia.

This four-day camp provides participants with a structured introduction to the nuts-and-bolts of writing funding proposals to support a wide range of Humanities work, from research travel and dissertation writing to public Humanities projects. By identifying specific funding opportunities and learning how to tailor proposals, HGWC participants are prepared to conceptualize appropriate proposals during their summer research.

The University of Texas at El-Paso

UTEP's Humanities Coalition project is designed to provide doctoral students in Borderlands History and Rhetoric and Composition with the skills and knowledge to secure resources effectively in their future careers. This project places grant and resource seeking in a framework of career diversity and contributes to building a broader understanding of career options at the institutional and program levels.

Fellows of the program are encouraged to acquire/deepen their skills in three areas: (1) identifying funding, (2) writing a competitive grant/fellowship proposal, and (3) transferring proposal development skills to diverse careers. Student participants will have completed at least one funding application that can be submitted during or after their time as Fellows.

Learn more with ***UTEP's Campus Newsfeed***

Howard University

Howard University established a formal professional development program for doctoral students in Humanities and Humanities-adjacent disciplines. The initiative consists of a for-credit pilot course and a workshop series that cover the full spectrum of the external funding process, including identification of potential funders; developing successful proposals; ensuring ethical grants management; conducting assessment, evaluation, and reporting activities; communicating research to non-academic audiences; and cultivating and sustaining funding relationships.

Purdue University

Purdue University established the Humanities Grant Writing Initiative in collaboration with the Departments of English, History, and Languages & Cultures.

In year one of the initiative, Purdue launched a Humanities–focused grant writing class for graduate students in the three partnering departments. Doctoral students were encouraged to participate in community design participation groups, which formulated a grant-writing certificate program in which students wrote community–based grants.

Additional information and resources can be found in a CGS webinar, ***Preparing Humanities PhDs for Careers in Grant-Writing and Resource Development*** and on pages dedicated to the Humanities Coalition's programs in ***grant-writing and resource development***.

C. The Importance of Relationship-Building as a Professional Skill

As noted above, it took longer for PhDs in the Arts and Humanities to reap the rewards of their doctoral training: Arts and Humanities PhDs were less likely than their peers in other fields to report satisfaction with their jobs three years post-graduation, although this gap closed at eight and fifteen years post-PhD. This finding points to the importance of preparing Arts and Humanities PhDs to develop relationships with mentors and potential employers who can help support their transition from graduate school to the first or second job.

The Mellon-funded Humanities Coalition also seeded projects designed to address this need. Universities that developed projects in this area told us that the concept of "networking," a term that emerged in the field of business, may for some humanists imply transactional, and self-interested, relationships. Some preferred to speak about "relationships" to discuss the connections that led to career advancement, but also learning, growth, and mentorship. Universities seeking to improve the ability of Humanities PhDs to develop and sustain professional relationships can find examples of programs on the Humanities Coalition's pages devoted to ***building relationships and networking***. Several of these programs are highlighted below.

Indiana University-Bloomington

Indiana University-Bloomington implemented Humanities–specific and broader campus initiatives to encourage and support networking and professional relationship building. These activities were designed to help students develop the relationships needed to explore a variety of careers.

One of these programs was a new Alumni Mentor Network facilitated through an NSF–funded and faculty–developed networking platform, Net.Create. This resource was collaboratively established by a team of digital Humanities practitioners, educational researchers, network-analysis specialists and software developers.

Wayne State University

The Humanities Clinic is an internship program that enhances graduate teaching in the Humanities and humanistic social sciences by hiring graduate students to work as paid, semester-long interns with Detroit non-profits and small businesses. The mission of the Humanities Clinic is to bring Humanities and social science expertise to communities throughout Detroit and to prepare PhD students for meaningful and diverse careers while supporting local businesses and non-profits.

Wayne State launched the NEW PATHS initiative to support the development of professional networking skills for graduate students. This initiative expanded the existing University Humanities Clinic with the following activities:

- a "wrap-around" series of workshops and networking events designed to support and reinforce the active experiences provided in the clinic.
- an annual networking luncheon for students, alumni, and community partners;
- a pilot internship program in the Humanities Clinic for students early in their doctoral careers.

As your institution helps its PhD students to expand their professional relationships, we encourage you to consider also the methods of alumni outreach outlined in chapter 2. Developing broad and diverse networks of PhD alumni working in a variety of workforce sectors can help Arts and Humanities PhDs identify career opportunities they didn't know existed, get support and encouragement from PhDs who have traveled similar career paths, and gain the confidence and skills needed to make connections with new allies and maintain them over time.

5: Closing Gaps in Knowledge: STEM

So I help create the experiments, I help design them. I pretty much run them, I do a majority of the data analysis, and I write the papers. […] And I'm learning a lot of skillsets that I didn't think were part of the job. I've learned how to manage people, manage time, manage projects, train people all at the same time [laughter].

—Kyra, Biomedical Engineering, Industry

[In my grant-writing course,] you were expected to write your own grant, and you were expected to reapply and reapply and beat the bushes. And that was unbelievably helpful in developing those skills but also just developing as a writer and being an effective communicator.

—Fatima, Social Science PhD, NGO professional

According to the 2023 NSF Survey of Earned Doctorates, doctorate holders, overall, have transitioned away from academic employment in the last 20 years (NCSES, 2024, p. 25). Meanwhile, the proportion of doctorate recipients with non-postdoc commitments in industry or business in the United States has more than doubled over this period.

There have been prominent efforts to recognize these trends and send a strong message that STEM PhDs are needed across all workforce sectors. There have also been significant investments in reforming STEM graduate education to prepare students for new skills needed both inside and outside the academy. In 2014, the NIH's Strengthening Biomedical Research Workforce program made awards for "Broadening Experiences in Scientific Training" (BEST) to help universities develop and test approaches to broadening graduate and postdoctoral education to meet workforce needs. In a consensus report published in 2019, the National Academies made a strong call to broaden graduate STEM education, with specific recommendations for supporting PhD preparation for a variety of careers. Meanwhile, the National Science Foundation's Division of Graduate Education has provided support for research designed to prepare PhDs for a variety of careers that will be needed to strengthen the U.S. STEM workforce.

Despite these initiatives, there has been a lingering gap in our understanding of what STEM PhDs do in their careers and how well their graduate education prepared them. With support from the National Science Foundation (#1534620,) CGS sought to identify the scope of occupational outcomes and career progression of STEM doctoral alumni; identify employment and occupational aspirations of STEM doctoral students and how those values align (or don't align) with STEM workforce needs; identify sociodemographic characteristics and doctoral program contexts that correlate with career choices and occupational outcomes for STEM doctoral students and alumni (e.g., field of study, gender, race/ethnicity, and participation in professional development program); and identify patterns of career progression of STEM PhDs.

The outcomes of this research, some of which are represented in the three sections below, can and should be supplemented by university and program-level efforts to understand PhD career outcomes in STEM. We encourage universities to compare patterns in their STEM alumni's PhD employment with the national trends represented below, and to explore additional data available in CGS's web-based ***PhD Career Pathways data dashboard***.

A: STEM Training and STEM Careers: How do they Align?[7]

I knew that I wasn't going to go the academic route. I really respect teachers and professors and people who can run research labs. I prefer not to do that. I'd much rather do research in industry if that's possible. […] So I went from very specific PhD training to very broad consulting. They basically only hire PhDs to do their consulting work. So that was a really interesting environment to be in.

—Finn, Electrical Engineering, Industry

In general, an analysis of PhD career satisfaction, regardless of career sector, offers good news: the vast majority of STEM PhDs work in fields related to their doctoral education and are satisfied with their jobs. According to the Survey of Doctoral Recipients by the National Science Foundation (NSF), 92% of employed doctoral scientists and engineers in 2017 held jobs that are closely or somewhat related to their PhDs (NSF, 2019). Through analysis of data from the Fall 2017 survey of PhD alumni, CGS sought to provide additional insight. How do STEM PhDs apply their doctoral training in the workforce?

Key findings are highlighted below:

- **A large majority of survey respondents in various stages of their postdoctoral careers believe that their STEM PhD education prepared them well for their jobs.** However, there are some differences between those employed by colleges and universities and those who were employed elsewhere. Among those who earned their PhDs in Life Sciences, Physical Sciences, or Engineering, proportionally fewer graduates who worked outside of the academy felt that their PhD education prepared them extremely well or well for their current jobs. There was no difference by sector of employment among those who earned a PhD in social and behavioral sciences. (**See Figure 17**)

7 Part A, Section 5 is partially based on a brief prepared by Hironao Okahana, Enyu Zhou and Timothy Kinoshita. Data presented in this section are based on the CGS PhD Career Pathways Fall 2017 Alumni Survey, which was distributed to doctoral degree recipients that were three, eight, or fifteen years out of their PhD in selected programs at 35 participating institutions. The sample sizes by field and by cohort are as follows: Biological Sciences (3-year, n=409; 8-year, n=262; 15-year, n=120), Engineering (3-year, n=402; 8-year, n=257; 15-year, n=124), Physical & Earth Sciences (3-year, n=387; 8-year, n=227; 15-year, n=139), and Social & Behavioral Sciences (3-year, n=274; 8-year, n=192; 15-year, n=137).

Figure 17: Percent Responding "Extremely Well" or "Very Well" to Survey Item, "How well did your PhD prepare you for [your current] job?" by Selected Employment Sector for Selected Fields & Doctoral Cohorts 3, 8, and 15 Years Post-Graduation.

		Academic	Non-Academic
Biological Sciences	3 Year	**80%**	**62%**
	8 Year	**81%**	**66%**
	15 Year	79%	72%
Engineering	3 Year	**87%**	**76%**
	8 Year	**87%**	**74%**
	15 Year	89%	81%
Physical & Earth Sciences	3 Year	**84%**	**75%**
	8 Year	**84%**	**71%**
	15 Year	**92%**	**67%**
Soc & Behavioral Sciences	3 Year	78%	67%
	8 Year	82%	76%
	15 Year	83%	86%

Boldface denotes statistically significant difference by employment sector. P<0.05

- **A large majority of survey respondents also think that they "definitely" or "probably" would still pursue a PhD in general and in the same field again.** Across different STEM broad fields and different PhD cohorts, alumni in both employment sectors were equally likely to say that they would pursue a PhD again. Notable exceptions are for Engineering and Physical & Earth Sciences alumni 15 years out. Although more than a half of them would still pursue PhDs again, fewer graduates in jobs outside of the academy, compared to those working for colleges and universities, indicated that they would definitely or probably do so. (**See Figure 18**)

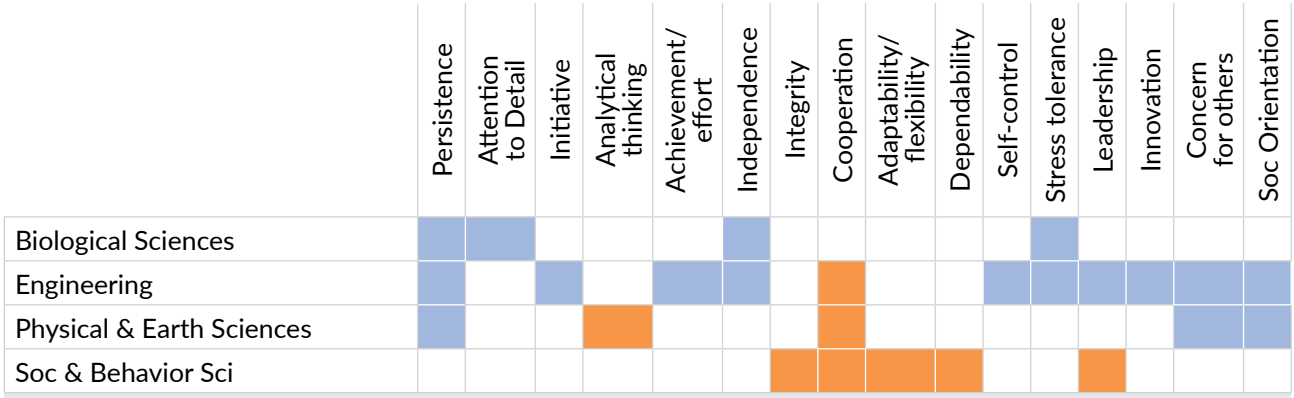
Figure 18: Percent Responding "Definitely Would" or "Probably Would" to survey item, "Given the perspective that you have gained since completing your PhD, if you had to start again, how likely would you do the following?" by Selected Employment Sector for Selected Fields & Doctoral Cohorts 3, 8, and 15 Years Post-Graduation.

		Pursue a PhD in General		Pursue a PhD in the Same Field	
		Academic	Non-Academic	Academic	Non-Academic
Biological Sciences	3 Year	84%	82%	**80%**	**67%**
	8 Year	83%	83%	83%	76%
	15 Year	88%	87%	82%	85%
Engineering	3 Year	**93%**	**83%**	85%	77%
	8 Year	87%	83%	**87%**	**77%**
	15 Year	**100%**	**88%**	**98%**	**82%**
Physical & Earth Sciences	3 Year	88%	83%	81%	74%
	8 Year	89%	90%	82%	77%
	15 Year	**96%**	**81%**	**88%**	**69%**
Soc & Behavioral Sciences	3 Year	82%	78%	77%	75%
	8 Year	87%	89%	82%	78%
	15 Year	92%	94%	88%	83%

Boldface denotes statistically significant difference by employment sector. P<0.05

- **PhD graduates both within and outside of academia identify similar important job skills and attributes.** Across different STEM broad fields and employment sectors, there are many similarities in terms of attributes and skills crucial in successfully performing their work. Persistence was one of the most important attributes across fields but was particularly important for those who work at colleges and universities. On the other hand, cooperation was particularly important for those working outside of the academy. (**See Figure 19**)

Figure 19 Differences in Importance of Attributes/Skills Between Those Employed by Colleges and Universities and Those Working Outside of the Academy by Selected Field



Blue denotes attributes that are more important for those working at colleges and universities, and orange denotes attributes considered more important by those working outside of the academy. No color denotes that there was no statistical difference by employment sector.

Together, these results suggest that STEM doctoral education offers relevant training that prepares graduates for jobs both inside and outside of the academy. Importantly, these data challenge the view that careers inside and outside academia require vastly different skills. Programs and graduate schools are encouraged to continue to offer training and professional development opportunities that lead graduates to a variety of fulfilling career paths.

Although large majorities of Engineering and Physical & Earth Sciences PhDs are satisfied with their PhD preparation for their current jobs, the numbers are lower for those who work outside of the academy. This finding was particularly interesting, since there is a long history of Engineering and Physical Sciences PhDs who work in the industry and other non-academic industries. Furthermore, fewer PhDs in Engineering and Physical & Earth Sciences who work outside of the academy reported that they definitely or probably would pursue a PhD in general or in the same field. These findings suggest that there is room for PhD programs in these fields to incorporate training and professional development opportunities, such as internships, that are more relevant to those who seek careers outside of the academy.

Conversation Starters on Career Preparation for STEM PhDs

- What kind of professional development opportunities does our institution provide PhD students in STEM fields for their career preparation outside of the academy and for achieving their long-term career goals?
- What kind of resources and guidance does our institution offer to STEM faculty members, so that they talk to their students about STEM PhD careers with more awareness of opportunities outside of the professoriate?
- What are our institution and its STEM PhD programs doing to foster partnerships with alumni and current and prospective employers of PhDs?
- How effective are our approaches and resources for fostering PhD education that lead graduates to a variety of fulfilling career paths? How are we assessing the effectiveness of these efforts?

B. The Postdoctoral Experience: A Focus on the Biological and Life Sciences[8]

PhD holders in the biological and life sciences pursue a wide array of careers in postsecondary, for-profit, not-for-profit, and government sectors. Among the many who will continue to work in the postsecondary sector, recent PhD recipients often pursue postdoctoral researcher positions to develop additional research skills, as well as lab management skills, and these opportunities are increasingly seen as a prerequisite to a tenure-track faculty position (Sauermann & Roach, 2016; Stephan, 2013). Although there are approximately 79,000 postdocs employed in the U.S. (Ferguson, McTighe, Amlani, & Costello, 2017), there is relatively little research on the benefits of postdoctoral appointments (Kahn & Ginther, 2017), particularly for those who transition into industry. What we know is that postdoctoral researchers have identified challenges related to professional development, the increasing length of postdoctoral appointments, finding a permanent position, and finances (DeJesus, 2012).

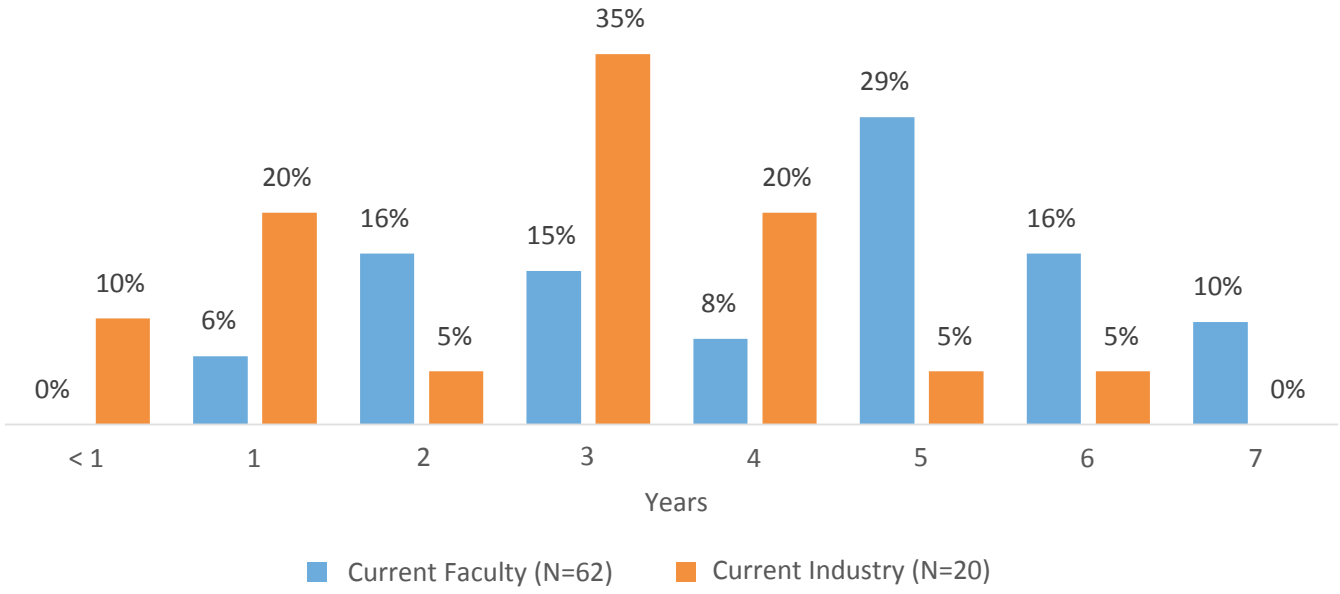
8 Part B, Section 5 is partially based on a brief prepared by Hironao Okahana and Radomir Ray Mitic. Data presented in this section are based on the CGS PhD Career Pathways Project Fall 2018 Alumni Survey, which distributed to doctoral degree recipients that were three, eight, or fifteen years out of their PhD in selected programs at participating institutions. Data presented in this section are based on the aggregated data set, which includes 1,420 doctoral degree recipients in biological and life sciences fields (e.g. Anatomy & Cell Biology, Biochemistry, Biological Sciences, Botany, Genetics, Health & Medical Sciences, Microbiology, Nutrition & Food Studies, Pharmacology, Zoology) from 55 institutions. This analysis focused on biological and life sciences PhD alumni who were employed as of October 1, 2018.

Considering these challenges, many STEM PhD alumni must consider the question, "Is a postdoc worth it?" Students must consider their career goals, the types of skills they are likely to gain through a postdoctoral experience, and the conditions of a particular appointment before answering this question. To support student decision-making and university support for postdocs, CGS examined further the career outcomes of PhD holders in the biological and life sciences with a particular emphasis on those who have been employed as postdoctoral researchers.

Key findings are highlighted below:

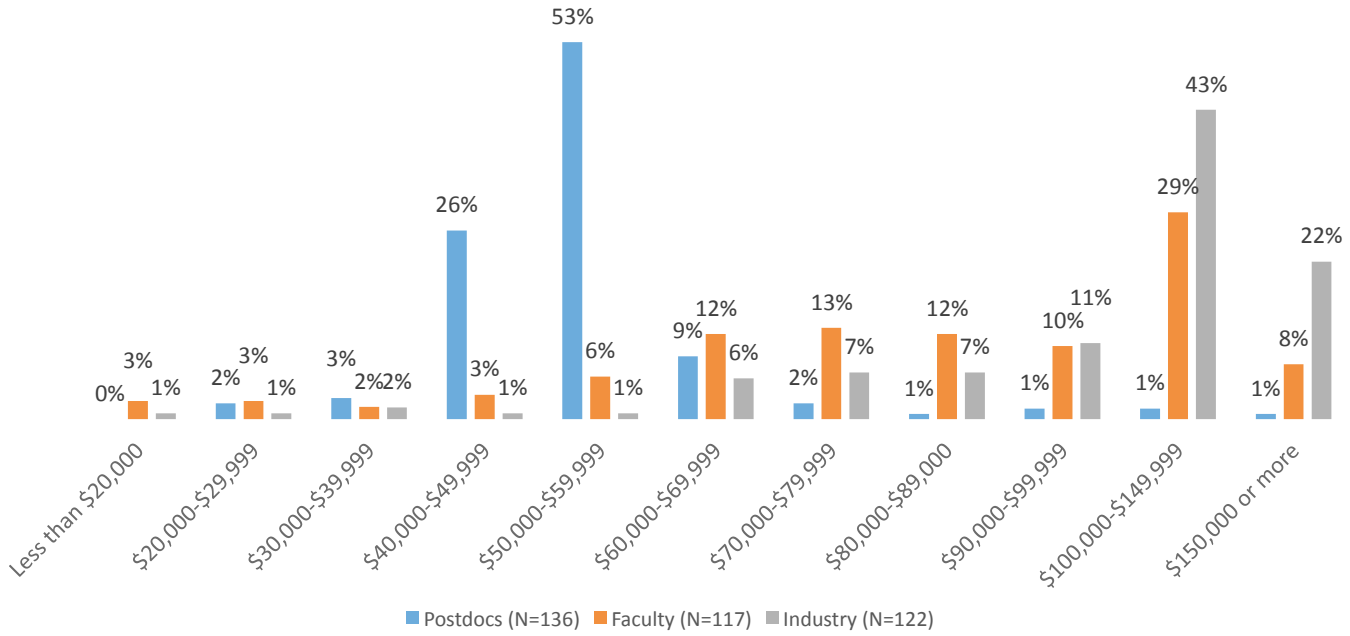
- Among PhD holders eight years post-degree who hold a faculty position, two-thirds reported that their immediate previous position was as a postdoctoral researcher (with the remainder coming nearly exclusively from other faculty or research positions).
- Within this current faculty group, more than half reported postdoctoral appointments lasting five or more years. For former postdocs currently working in industry, more than half left their postdoc after the 4th or 5th year (**See Figure 20**)
- Among PhD holders three years post-degree, there was no statistically significant difference between those holding faculty positions (M = 3.81 out of 5) and postdoctoral researchers (M = 3.88 out of 5) in terms of their perceptions of how well their doctoral program had prepared them for their current position.
- Over one-half of the PhD holders three years post-PhD who are currently employed as a postdoctoral researcher has a salary between $50,000-$59,999, with nearly a third earning less than $50,000. Those already in faculty positions, however, had higher earnings, with over one-third earning above $100,000. At three years out, an even greater share of PhD holders who worked for the business or for-profit sector reported earnings over $100,000. (**See Figure 21**)
- While those employed in industry enjoyed higher earnings compared with faculty and postdocs, PhD holders in industry positions reported that their jobs were less closely related to their field of PhD study. However, many of these PhD holders in industry still worked in scientific research positions (**See Figure 22**)

Figure 20: Length of Postdoctoral Appointments by Job Type (8-Year Cohort)



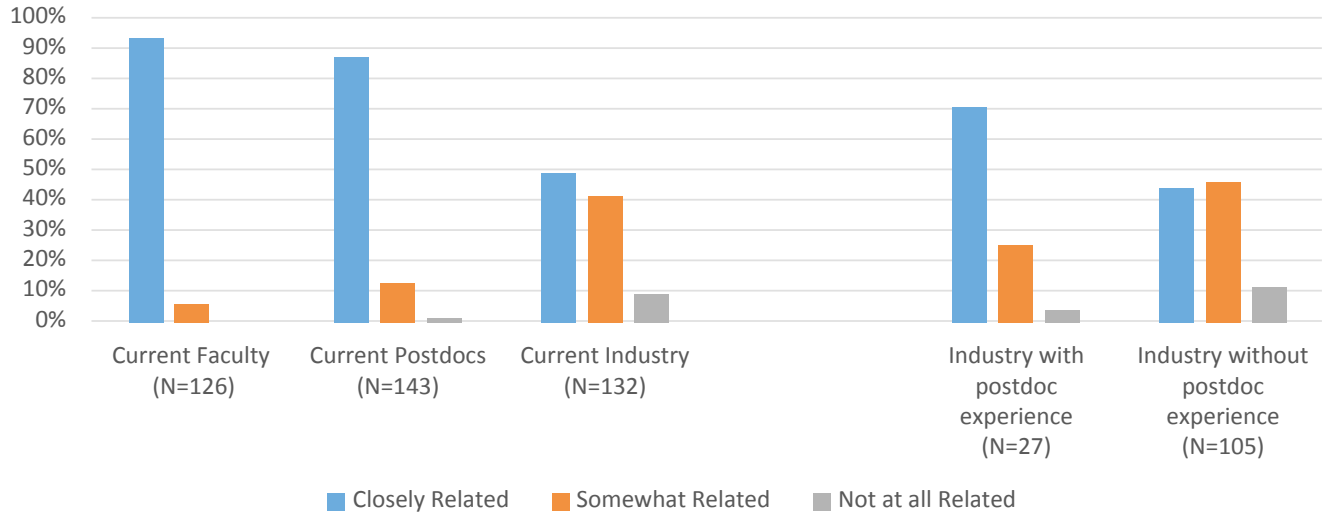
Data Source: Council of Graduate Schools, Understanding PhD Career Pathways for Program Improvement (NSF/DGE #1661272 and Mellon Foundation #31600612), Fall 2018 Alumni Survey.

Figure 21: Salaries by Job Type (3-Year Cohort)



Data Source: Council of Graduate Schools, Understanding PhD Career Pathways for Program Improvement (NSF/DGE #1661272 and Mellon Foundation #31600612), Fall 2018 Alumni Survey

Figure 22: Job Relatedness by Job Type (3-Year Cohort)



Many current faculty members appear to have held prolonged postdoctoral researcher appointments prior to holding their current positions. Postdoctoral opportunities undoubtedly offer valuable training and professional development experiences to PhD degree holders. However, it was not clear from the data if the postdoctoral experience significantly enhanced their preparedness for a faculty position, given that there was no statistical difference in the self-reported sense of preparedness for current jobs between faculty members and postdoctoral researchers among the three-years-out group.

In addition to the prolonged postdoctoral appointments, relatively low salaries may deter promising researchers from taking positions that appear to be important pathways to faculty jobs due to concerns over lower pay at important junctures in their lives, such as family formation and buying a home. For postdocs considering staying in their positions beyond the typical five years, moving to a career in industry may provide stronger immediate financial returns on their education while still using research skills gained during PhD studies.

Finally, while a move to industry may bring a higher salary, such a move takes the PhD holder further away from their specialized field of study. This difference, however, seems to be mitigated by prior experience as a postdoc in a postsecondary institution, pointing perhaps to better professional development experiences for industry during a postdoctoral researcher appointment.

Conversation Starters on the Postdoctoral Experience

- What kind of professional development opportunities does your institution provide PhD students in the life sciences for their career preparation and transition from graduate school, particularly for postdoctoral research opportunities?
- How can students and postdoctoral researchers benefit from an Individual Development Plan (IDP) to prepare them for the career of their choosing?
- How does your institution ensure a smooth and timely transition for postdoctoral researchers into permanent roles as faculty members or to other types of careers (through policies, resources, etc.)?

C. What we know about Professional Development for STEM PhDs[9]

During PhD study, professional development 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 professional development for PhD students, it is important to understand who participates and what types of opportunities are available. Academic professional development that focuses on skills related to the academic portion of the PhD (i.e., academic writing, data analytics, etc.), whereas other types of professional development include important skills like leadership, networking, public speaking, etc.

CGS researchers analyzed STEM PhD students' participation in academic professional development and how participation differs by race and gender using data from the PhD Career Pathways project. Given that minoritized 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 experiences as well as opportunities for making academic professional development more inclusive (Zhou & Gao, 2021).

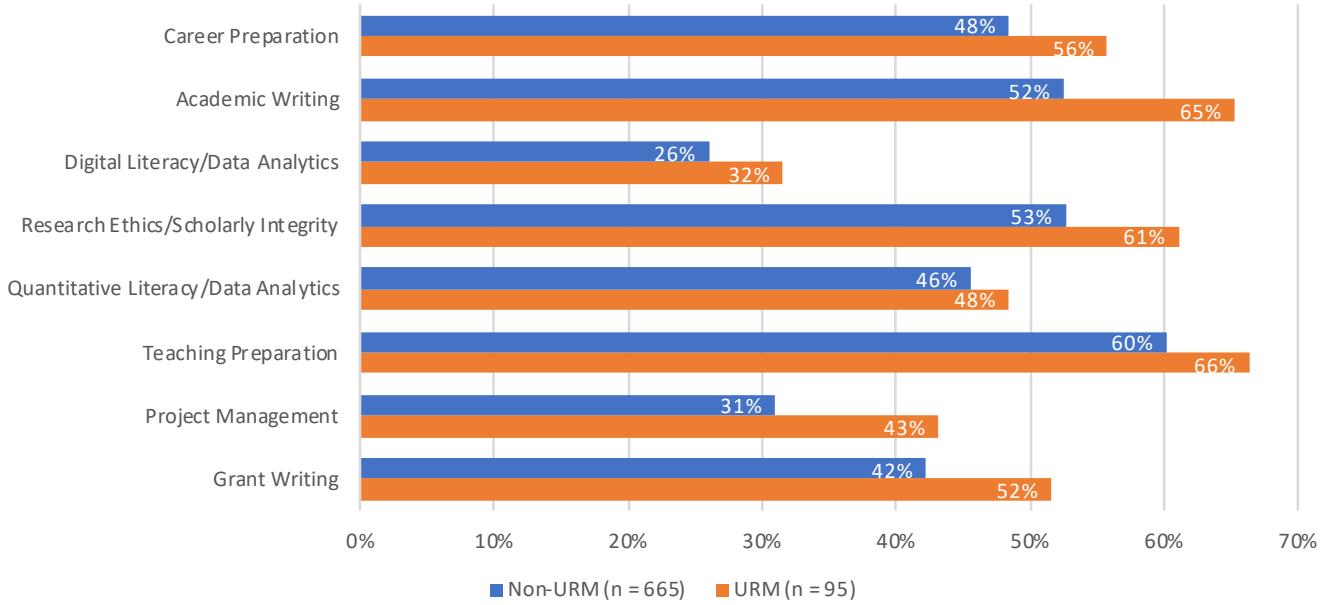
The analysis was focused on doctoral students in selected science fields, including Life and Health Sciences, Physical and Earth Sciences, and Engineering, Math, and Computer Science. We define underrepresented minority (URM) doctoral students as American Indian/Alaska Native, Black/African American, Hispanic, and Native Hawaiian and Pacific Islander and non-URM doctoral students are White and Asian.

9 Part C, Section 5 is partially based on a brief was prepared by Ariana Garcia and Enyu Zhou. This brief is based upon an aggregated data set from a PhD Career Pathways Follow-Up Student Survey that 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. The data set includes 953 science doctoral students.

Key findings are highlighted below:

- **Underrepresented Minority Doctoral Students have greater participation in academic professional development.** URM science doctoral students have greater participation in each category of academic professional development (**See Figure 23**) than non-URM doctoral students. The largest differences between URM and non-URM science doctoral students were project management (12% points) and academic writing (13% points).
- **Participation in academic professional development varies by gender.**[10] Female students participated in professional development at higher rates than male students among science doctoral students (**See Figure 24**). The largest difference between male and female science doctoral students was in academic writing with a 10%-point difference in participation.
- **Science doctoral students participate in professional development opportunities offered by PhD programs.** Across most academia-focused professional development 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 (**See Figure 25**). The only exception is career preparation (i.e. CV preparation, interviewing), where students are participating at a greater rate in institution-wide opportunities.

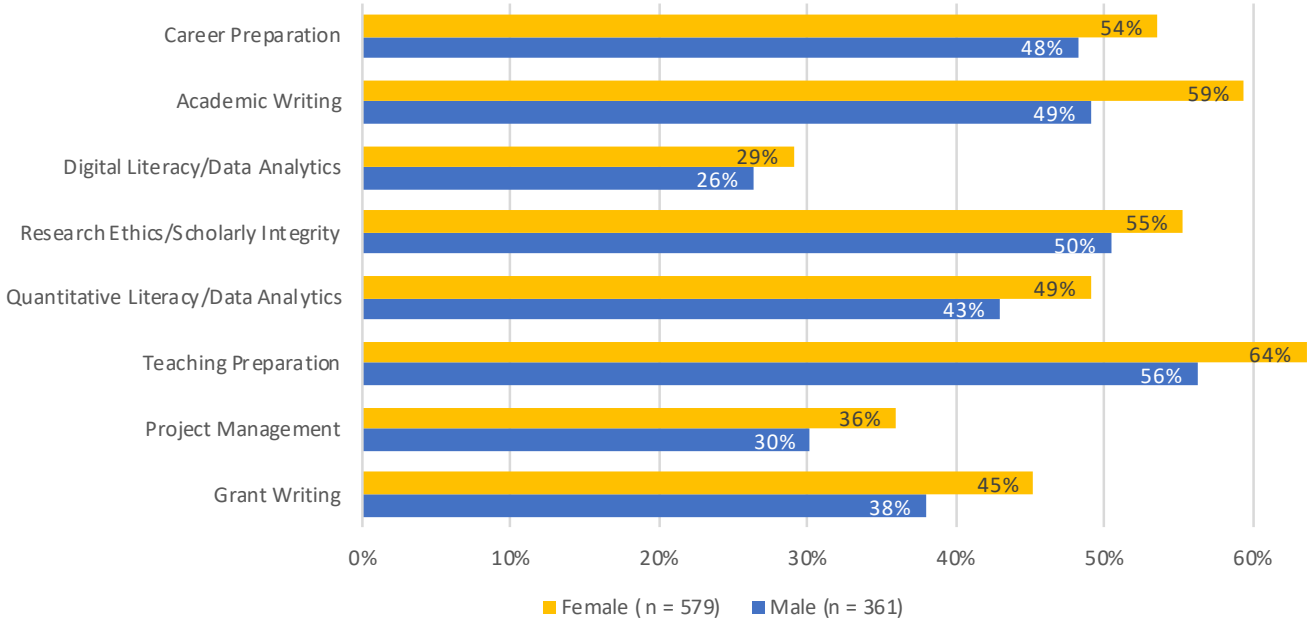
Figure 23: Professional Development Participation for Science Doctoral Students by Race



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

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

Figure 24: 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.

Figure 25: 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.

Our study cannot speak to why minoritized students participate in professional development 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 provide doctoral students with new skills, but also to provide validation, support in forming a professional identity, and a sense of community.

Of the three types of delivery models for professional development (offered by the PhD program, institution-based, and offered outside the institution), science students participated largely in opportunities offered by the program. This is not surprising, since much of doctoral training is nested at the disciplinary level. Given that many graduate students seek professional development opportunities from their programs, it is important that graduate schools work with graduate programs to make sure that students have access to high-quality professional development opportunities regardless of their home departments.

Conversation Starters for PhD Professional Development

- How can your institution increase participation in professional development among all students?
- URM and women are generally underrepresented in science, yet they are participating in professional development at greater rates. How are professional development opportunities developed to benefit the diverse needs of the students participating?
- Given that science doctoral students are largely participating in professional development within their PhD program, how can institutions ensure that centrally-offered professional development 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 professional development?
- 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 professional development, does your institution have a plan for providing or encouraging programs in this area?

6: Conclusion

In the decade that has passed since the PhD Career Pathways project was first launched, the graduate education community has continued to see strong student demand for PhD programs. While there is evidence suggesting that some institutions, particularly R-1 universities, have selectively reduced cohort sizes—sometimes in conjunction with efforts to increase stipend amounts for admitted students—first-time enrollment in PhD programs has remained strong nationally, increasing nearly 2% between fall 2018 and fall 2023 (Lanier et. al., 2024).

Many of the students entering these programs today will do so with the intention of pursuing an academic career. As noted previously, however, it is likely that fewer than half of all PhD students will find themselves in a faculty position. Our call throughout this book is to abandon the assumption that the academic job market will identify the best, brightest and most suitable students for these positions. To do so ignores important facts about students and the higher education systems in which they study and work.

In closing, we urge faculty, staff and administrative leaders to consider the following positive assumptions about students entering PhD programs today. These stand in contrast to some of the negative and limiting assumptions about PhD career pathways that began this report:

- **Many PhD students will put personal priorities above an academic career.** These may include the ability to have more control over where they live and work, the timing of family formation, and the levels and types of career-related stress they are willing to undertake. These life choices that are often entangled with a person's health, class, gender, family commitments, and other factors.
- **Many PhD students and alumni will find passion and purpose using their training in careers in the business, government and non-profit sectors.** These students and alumni may wish to use the skills developed in their program in a different career or may find greater satisfaction in using skills differently valued between academic and non-academic jobs.[11]
- **Many first-generation graduate students may be drawn to careers with greater job security, proximity to family, and opportunities to serve their communities.** Universities must ask what they can do to make faculty positions attractive to students representing a wide variety of backgrounds.

11 See chapters 3, 4 and 5 for a discussion of how PhD alumni in different workforce sectors weight different skills.

If we accept that students may come to graduate school with different and changing priorities, we create room for discussing different ways to support them. We can be better prepared to support the Art History PhD student who dreams of leading a museum, the Biochemistry PhD who is interested in developing vaccines at a pharmaceutical company, the Philosophy PhD who wants to improve ethical practices in industry, or the Physics PhD who will become a leader in science policy.

Supporting the variety of student ambitions is an institutional responsibility. At a time when the American public is expressing increasing skepticism about the value of institutions of higher education (Pew Research Center, 2024), it is also in the interest of universities to celebrate the accomplishments of students translating their knowledge and skills into a wider variety of workforce sectors. Instead of asking the question, "What are the costs to our institution when students don't go on to faculty positions?" we can ask the question, "What are the benefits to our institution when PhD students succeed in the business, government and non-profit sectors?" In more concrete terms, how can a broad and diverse PhD workforce help to address the problems we face in our communities?

For faculty and students to embrace this work, we will need to consider expanding definitions of scholarly and research merit and the types of work PhD students undertake and produce. As a community, we will need to seriously reconsider acceptable dissertation formats, encourage and support faculty who create high-impact research products that do not take the form of peer-reviewed publications, and develop ways for students to earn credit for experiential learning. This will require reflection on internal university programs and policies, as well as stronger connections between universities and the places and communities where PhD alumni seek employment. Work that is meaningful to PhD alumni stands to benefit the institutions that prepared them as well as the communities these alumni will go on to serve.

7: Selected Resources

The following short list of selected resources are chosen for their focus on providing practical guidance, recommendations, and tools to support diverse PhD careers.

General Resources

CGS PhD Career Pathways Project Resources (Web Resource)

The CGS website includes individual data briefs based on PhD career pathways data that can be easily shared with faculty, staff and senior leadership at your institution. Resources also include a standalone flyer on *Shaping New Narratives about PhD Careers* and the PhD Career Pathways data dashboard.

Beyond the Professoriate (Website)

Beyond the Professoriate is a career training platform for doctoral students and PhDs designed to prepares them for careers as faculty or beyond the professoriate. The site offers on-demand courses and live workshops to explore career options, make informed career decisions, and learn proven job search strategies to secure employment in their chosen career field.

The Future of the Doctoral Dissertation (Web Resource)

Developed by CGS and its faculty and organizational partners, this compilation of papers addresses the ways in which dissertations might evolve to support diverse careers.

PhD Education Initiative Toolkit (Web Resource)

The American Association of Universities' PhD Education Initiative aimed to change the culture surrounding doctoral education at AAU member institutions so that graduate education is more student-centered, placing greater emphasis and focus on students as individuals with diverse educational and professional interests, needs, and challenges. The initiative resulted in a toolkit that includes planning questions and discussion guides for doctoral programs and institutions.

Supporting Diverse PhD Career Pathways in the Humanities:

American Philosophical Association: Beyond the Academy (Web Resource)

The APA guide addresses professional opportunities for philosophers interested in careers outside the academy.

Public Pathways: Lessons about PhD Careers from 10 Years of Mellon/ACLS Public Fellows (Report)

This report explores the experiences of fellows in the program, their career paths, and their perspectives on opportunities and challenges for PhDs in the workplace. Interviews with fellows' supervisors at their host organizations also offer insight into how Humanists' skills are valued beyond the university. It concludes with ***recommendations and advice*** for graduate students and recent PhDs, doctoral faculty and departments, and leadership at universities and scholarly associations.

AHA Career Diversity Resources (American Historical Association) (Web Resource)

The AHA website includes AHA Career Contacts, a free mentorship program for history PhD students and early-career PhD historians, and Where Historians Work, an interactive database of history PhD career outcomes.

ImaginePhD (Web Resource)

ImaginePhD is a free online career exploration and planning tool for PhD students and postdoctoral scholars in the Humanities and Social Sciences.

The Humanities Indicators (Web Resource, Reports)

The Humanities Indicators is a nationally recognized source of nonpartisan information on the state of the Humanities, providing researchers and policy-makers with better tools to answer basic questions about areas of concern in the field.

Promising Practices in Humanities PhD Professional Development (Report)

This CGS resource summarizes lessons learned from the National Endowment for the Humanities' NextGen Humanities PhD program. The publication includes promising strategies for preparing Humanities PhDs for diverse careers.

Supporting Diverse PhD Career Pathways in STEM:

ChemIDP (Website)

Developed by the American Chemical Society, this website offers a career planning tool for chemical scientists.

Graduate STEM Education for the 21st Century (Report)

This consensus study by the National Academies of Sciences, Engineering, and Medicine advocates for career exploration and preparation for graduate students. The report calls for STEM graduate students to have opportunities to explore the variety of career opportunities and pathways for holders of STEM graduate degrees.

Innovations in Graduate Education Hub (Website)

Hosted by CGS, the IGE Hub fosters learning and collaboration among grantees of NSF's Innovations in Graduate Education (IGE) and disseminates information and opportunities across the wider STEM community. The website provides ***models and resources*** from research projects that test innovations in professional development for STEM graduate students.

myIDP (Web Resource)

myIDP is a free, web-based career-planning tool that was created to help graduate students and postdocs in the sciences define and pursue their career goals.

Pd|hub (Professional Development Pub (Website)

Pd|hub is a multi-stakeholder initiative to advance the career and professional development of scientists. Its website provides curated, peer-reviewed educational models to advance practices in specific professional development competency areas for graduate students and postdocs in STEMM.

Strengthening the Biomedical Research Workforce (Web Resource)

Part of the National Institutes of Health website, this web resource provides includes publications focused on strengthening the biomedical research workforce, including publications related to the NIH "Broadening Experiences in Scientific Training" (BEST) Initiative, which focused on broadening PhD careers.

Appendices

APPENDIX A
Participating Universities

Survey Implementation

The following institutions committed to implementing the PhD Career Pathways survey instruments and submitting data to CGS for aggregate analysis.

Arizona State University
Brown University
Case Western Reserve University
City University of New York Graduate Center
Cleveland State University
Colorado School of Mines
Emory University
Florida International University
Fordham University
George Washington University
Georgia State University
Howard University
Indiana University
Iowa State University
Kansas State University
Louisiana State University
Loyola University Chicago
Medical University of South Carolina
Michigan State University
Morgan State University
New York University
North Carolina A&T State University
Northwestern University
Purdue University
Rice University
Rochester Institute of Technology
Binghamton University
Stony Brook University
The University at Albany
The University at Buffalo
Texas A&M University
The University of Southern Mississippi
University of Arizona
University of Arkansas
University of California, Berkeley
University of California, Davis
University of California, Irvine
University of California, Los Angeles
University of California, Merced
University of California, Riverside
University of California, San Diego
University of California, San Francisco
University of California, Santa Barbara
University of California, Santa Cruz
University of Delaware
University of Georgia
University of Illinois at Chicago
University of Illinois at Urbana-Champaign
University of Iowa
University of Kansas

University of Kentucky
University of Maryland - Baltimore County
University of Massachusetts Amherst
University of Minnesota
University of Missouri, Columbia
University of Nebraska Medical Center
University of Nebraska-Lincoln
University of Nevada, Las Vegas
University of New Hampshire
University of North Carolina at Chapel Hill
University of Notre Dame
University of Oklahoma
University of Oregon
University of Pittsburgh
University of Rochester
University of South Carolina
University of Texas at Austin
University of Texas at El Paso
University of Virginia
University of Washington
University of Wisconsin-Madison
University of Wisconsin-Milwaukee
Wayne State University
West Virginia University
Worcester Polytechnic Institute

The Humanities Coalition

The *Humanities Coalition* network built upon the survey findings to enhance the knowledge base and suite of promising practices that better support preparation for diverse Humanities careers. The following 16 institutions participated, representing projects in the following areas: Preparing for Diverse Careers in Teaching, Grant Writing and Securing Resources, and Building Professional Relationships.

Arizona State University
Howard University
Loyola University Chicago
Purdue University
The University of Southern Mississippi
The University of Texas at El Paso
University of California, Irvine
University of Missouri
University of Wisconsin-Madison
CUNY Graduate Center
Indiana University Bloomington
Michigan State University
Texas A&M University
University of Arizona
University of Rochester
Wayne State University

APPENDIX B
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National Humanities Alliance

Paula Krebs
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Notes

Notes

PhD Career Pathways

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