

After the PhD: the role of advisors and social connections in the job search process

After the PhD

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Abstract

Purpose – While ample literature describes students' experiences during graduate school, fewer studies examine how doctoral students transition into full-time employment post degree completion. The purpose of this study is to examine how faculty advisors, as well as other individuals, shape students' experiences during a critical period in their graduate education – the job search.

Design/methodology/approach – This study is based on interviews with 47 PhD students in biological sciences in the US. This is a descriptive qualitative study, based on in-depth, semi-structured interviews.

Findings – Results reveal distinct roles that faculty advisors play in the job search process, including supportive, unsupportive and sponsorship. Supportive advisors offer opportunities for skill development and specific guidance during the job search process. Sponsorship advisors go beyond providing general support to leverage their personal networks to assist in the transition into full-time employment. Unsupportive advisors are on the other end of the spectrum and do not provide any assistance. In addition, the majority of doctoral students rely on individuals beyond their advisors during the job search, and they do so regardless of what type of support they receive from their advisors.

Originality/value – Presented findings highlight the complex constellation of social connections that graduate students draw on for entry into the career and make a compelling case for extending socialization research to dedicate more attention to students' transition into full-time employment after degree completion.

Keywords Socialization, Doctoral education, Job search, Career transitions, Advisors

Paper type Research paper

One of the goals of doctoral education is the training of experts who will contribute to society through participation in professional careers that foster scientific innovation, both within academia and beyond, but we know very little about how graduates navigate the transition between education and work. Despite ample literature describing students' developmental and learning experiences during graduate school, less research focuses specifically on doctoral



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students' experiences seeking employment. While a small body of scholarship explores career preparation and employment aspirations among PhD students (e.g. [Chen, 2021](#); [Coso Strong and Sekayi, 2018](#); [Golovushkina and Milligan, 2012](#)), fewer studies examine how doctoral students actually experience the transition to full-time employment after graduation – a critical stage in their professional journey into the workforce.

Socialization literature provides extensive evidence of faculty advisors supporting student success (e.g. [Burt, 2017](#); [Gardner, 2010](#); [Griffin *et al.*, 2020](#); [Weidman, 2010](#)), but often stops at the point of degree completion. We advance this work by focusing specifically on the support faculty advisors provide during the job search process. Moreover, researchers have increasingly acknowledged limitations of the advisor-student dyad and noted that individuals beyond the advisor, such as other faculty, peers, professionals and family, play an important role in doctoral student development ([Burt, 2019](#); [Feldon *et al.*, 2019](#); [Gardner, 2007](#); [Sweitzer, 2009](#)). However, little is known about how these relationships may shape students' experiences during the job search process.

We interviewed 47 doctoral students enrolled in biological sciences programs across the US about their experiences during the job search to address the following questions:

RQ1. What role do faculty advisors play in the job search process?

RQ2. Whether and how do graduate students leverage other individuals beyond the advisor in their job search process?

Data analysis identified three different types of advisor roles: supportive, unsupportive and sponsorship. Supportive advisors offer opportunities for skill development as well as specific guidance and assistance during the job search. Sponsorship advisors go beyond providing general support to leverage their personal networks to assist in the transition to full-time employment after graduation. Unsupportive advisors are on the other end of the spectrum and do not provide any assistance. In addition, the vast majority of doctoral students rely on individuals beyond their advisors as they seek employment opportunities. Notably, students rely on connections beyond the advisor regardless of what type of support they are receiving from their advisors. Presented findings highlight the diverse constellation of social connections that graduate students draw on to facilitate entry into the career and make a compelling case for extending socialization research to include the transition to full-time employment after degree completion.

Theoretical framework and literature review

Much of the research on doctoral education, particularly in the US, has relied on the socialization framework to understand students' experiences during graduate school (e.g. [Gardner, 2007](#); [Gardner and Mendoza, 2023](#); [Johnson *et al.*, 2017](#); [Weidman, 2010](#)). As students progress through their graduate programs, they learn the skills, knowledge, attitudes, dispositions and values of their chosen disciplinary community and professional field ([Austin and McDaniels, 2006](#)). Graduate training is unique because students learn both graduate student and professional roles in tandem, including how to transition into their careers ([Austin, 2002](#)). While doctoral students learn through a variety of socializing relationships, existing research often considers interactions with the faculty advisor as foundational to students' personal and professional development ([Burt, 2017](#); [Gardner, 2010](#); [McCain *et al.*, 2024](#); [Weidman, 2010](#)). The role of the advisor is particularly salient in lab sciences, wherein students' time, research opportunities and funding are often tied to their faculty advisor's lab ([Maher *et al.*, 2020](#)).

The social landscape of the job search

While socialization literature documents various ways in which advisors support graduate student learning and development, fewer studies consider how advisors support career transitions (Curtin *et al.*, 2016; Golde, 2005; Griffin *et al.*, 2020; Noy and Ray, 2012; Pyhältö and Keskinen, 2012; Schneijderberg, 2021). A few studies across different national contexts indicate that this is a fruitful area of inquiry. Using US-based survey data of advanced doctoral students, Zhao *et al.* (2007) reported that students were more satisfied with advisors who provided career development opportunities and demonstrated care, in addition to providing academic advising (see also Barnes *et al.*, 2012). Drawing on mixed methods longitudinal data from social science PhD students in Canada, McAlpine and colleagues (2013) noted that faculty relationships played a crucial role in shaping doctoral students' career aspirations and trajectories. These studies indicate that support for career development is an important dimension of advising.

It is not only students but also faculty, who report providing career-related advice. Gardner (2010) interviewed 16 faculty members in a variety of disciplines about their role in doctoral student development and found that some advisors routinely discussed career preparation with their students. Moreover, in a qualitative study of early career business professionals participating in mentorship programs, Ibarra *et al.* (2010) found that some mentors take on the role of sponsors, advocating for their mentees and providing access to personal professional networks to help advance their careers. Although focused on a specific mentoring program, this study indicates that faculty could take on a more active role in the job search process that goes beyond providing general career advice.

Scholars have increasingly acknowledged limitations of the student-advisor dyad and noted the importance of considering a broader constellation of relationships that shape graduate student success and development (Burt, 2019; Gardner, 2007; Mantai, 2017; Sweitzer, 2009). Gardner (2007) noted that students regularly relied on peer networks to understand expectations and navigate their programs, while other recent studies have highlighted the importance of postdocs and senior graduate students (e.g. Blaney *et al.*, 2020; Feldon *et al.*, 2019). A few studies also indicate that students receive career support from an even broader network of individuals (Lovitts, 2001). Germain-Alamartine *et al.* (2021) study of Swedish, Norwegian and UK students reported that faculty advisors may be less beneficial than other networks, particularly if advisees pursue industry career paths. Moreover, in a survey of faculty and doctoral students at a large university in the Netherlands, Emmerik (2004) reported that those with larger mentorship constellations, including informal social contacts, personal connections and other professional relationships inside and outside of the university, reported higher career and job satisfaction.

Collectively, previous socialization literature highlights the central role of faculty advisors in shaping graduate students' experiences during their programs. In comparison, career development has received less attention. Moreover, while the research notes that faculty advisors (and other individuals) provide career guidance and support, they do not focus explicitly on the job search process itself. The guidance students receive throughout their graduate education is crystalized at the point of transition to the labor market, making the moment of transition to the career an important site of inquiry. We acknowledge that some doctoral students, especially in international contexts, may already be participating in the labor market while attending graduate school. However, this is rarely the case for full-time doctoral students in Science, Technology, Engineering, and Mathematics fields at US institutions, such as the participants in this study, who are limited to part-time roles as research or teaching assistants until program completion.

It is worthwhile to note that there is a separate body of work concerning doctoral students' employment. This work includes two primary strands. One explores doctoral student career preparation and whether students feel ready to enter different career paths (e.g. [Coso Strong and Sekayi, 2018](#); [Golovushkina and Milligan, 2012](#); [Renbarger et al., 2022](#)). These studies indicate that doctoral students often struggle to feel adequately prepared for the professoriate, and this may be the case despite attending departmental training sessions for this explicit purpose. In response to this need, graduate departments are increasingly placing greater priority on researcher development programs for PhD students and postdoctoral scholars ([Roulston et al., 2013](#)). The second strand of the literature focuses on career intentions – in particular examining factors associated with doctoral students' aspirations to remain in academia or pursue nonacademic careers (e.g. [Chen, 2021](#); [McAlpine et al., 2013](#); [Seo and Yeo, 2020](#)). While these studies provide valuable insights into doctoral students' career choices, they rarely attend to the process of the job search itself, and the role of various social actors – including advisors – when graduates seek full-time employment.

Data and methods

Data for this project are based on the interview portion of a mixed-methods study of students who entered biological science PhD programs in the US in the fall of 2014. Students were recruited from 53 universities with high research activity. The respondents were followed through completion of their degrees and transition into full-time employment. The fields included in the study represent “bench biology”: microbiology, cellular and molecular biology, genetics and developmental biology. Students participating in the study completed annual surveys. In addition, a subsample of survey respondents were invited to participate in annual interviews.

In biological and biomedical sciences, the median time to degree completion in the US is approximately 6 years ([NCSES, 2022](#)). Students may participate in tailored activities during the summer (such as industry internships) or serve as teaching or research assistants, but focus on their full-time studies until degree completion, when they transition to full-time jobs. Data for this project are drawn from years 5 (Summer 2020), 6 (Summer 2021) and 7 (Summer 2022) of the study. All interviews were conducted virtually and recorded. Subsequently, interviews were transcribed and coded using Dedoose software. The sample is restricted to students who were actively looking for full-time employment or had recently secured full-time employment. The sample includes 47 respondents, including 30 (64%) women and 13 (28%) students from minoritized racial/ethnic groups (students who selected Black, Latinx or American Indian as a sole or one of their racial/ethnic identities). The average age of participants was 31. While the ages range from 27 to 40, the majority of the participants were in their early 30s. Both the median and mode are 30, and the middle 50% of the distribution is between 29 and 33 years old.

Data collection and analysis

This is a descriptive qualitative study, based on in-depth, semi-structured interviews ([Patton, 1990](#)). Our methodological strategy combined an inductive approach to data analysis with a flexible orientation to areas of interest based on previous literature, with the goal of striking a balance between preconceptions and discovery ([Deterding and Waters, 2021](#)). This enabled focused exploratory coding along important touchpoints in graduate student socialization, such as the role of specific relationships in career development. The primary questions analyzed were those related to the transition to full-time employment, including:

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- Q1. In what ways do you feel like your advisor has helped you prepare for your career path, if any?
- Q2. What opportunities or experiences have they offered that are related to your career preparation?
- Q3. How did you find this position?
- Q4. What role did your graduate school advisor/PI play in your search and selection process?
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- Q5. Was there anyone else who was helpful (e.g. other faculty or mentors, postdocs, administrators on campus, programs and the career center)?

Given limited research on the job search process of doctoral students, this is largely an exploratory study, although the topical focus of our analysis was guided by the theoretical framework of graduate student socialization (Burt, 2017; Gardner, 2010; Weidman, 2010). Socialization describes the process of learning and development through which students move from novices to professionals and, at the end of the process, transition into their desired career. Faculty advisors play a central role in the socialization process, including preparation for the career, and their role is especially salient in lab sciences, where graduate students' experiences are embedded within a laboratory and involve close work with their advisor/principal investigator (PI) (Maher *et al.*, 2020). In addition to advisors, the literature points to other individuals, from other faculty members to postdocs and peers, as playing a role in the learning and development of graduate students (Sweitzer, 2009).

Thus, our analysis focused on two domains that reflect the role of different relationships in the graduate student socialization process as students engage in the job search: faculty advisors and other social connections. In the first round of coding, we identified all references to faculty advisors and other connections leveraged throughout the job search process. Following, we reread all of the excerpts to thematically organize the findings. With respect to faculty advisors, there was a clear variation in the extent to which advisors provided support, and we organized that data presentation into three categories: supportive, unsupportive and sponsorship advisors. The other social connections leveraged during the job search varied in the extent to which they were related to the university, including those that were in some way connected to the university and those that were beyond the university context.

Findings

The role of faculty advisors

Given the centrality of faculty advisors in doctoral education, we begin by focusing on their role during the job search process. We identified three different advisor types during this crucial transition: supportive ($n = 24$, 51%), unsupportive ($n = 13$, 28%) and sponsorship ($n = 10$, 21%).

Supportive advisors. The hallmark of supportive advisors is creating opportunities for students to thrive and develop skills that they can leverage in the labor market, in addition to offering more specific assistance in terms of advice and writing recommendation letters. For example, Tyler noted that his advisor could not provide direct assistance because he was interested in pursuing a consulting position and “was going in a path that he [his advisor] hadn’t had anybody follow before [...]” His advisor was unfamiliar with the consulting industry and therefore unable to offer support tailored to entering that particular field. However, when describing how his advisor was helpful to his job search, Tyler stated:

I think it's less of what he did actively and more of what he didn't do and what he allowed to happen. A lot of it, I think, is just making the space for me to pursue the types of things in grad school that I felt were important for me to be able to go in the types of paths that I wanted to go [...].

By having the freedom to explore career and professional development opportunities, Tyler participated in leadership summits and summer internships. Participation in these activities, and the insights they provided, facilitated his job search and postgraduate plans.

Similarly, Mary had an advisor who could not provide specific guidance, as she was interested in non-academic paths. But the advisor helped her build the skills she needed. When asked how her advisor has supported the job transition, she described:

[...] with the career that I'm going into, he doesn't have many contacts specifically in that field. As far as providing direct support in that manner, he hasn't been able to do that, but in other ways he's provided opportunities for me to enhance a skill, so a transferable skill that would definitely be necessary for—with any role that I find myself going into.

When the research and career interests of advisors and students aligned, they could provide more specific guidance. For instance, Michelle described that “in the beginning [of the job search] she [her advisor] helped me a lot to decide the people that I would like to work with.” Because Michelle's advisor had been working in the field she was interested in pursuing for decades, she was well-equipped to offer advice about whose lab might be a good fit. In addition to providing recommendations of which labs to apply for, her advisor also provided letters of recommendation and tailored feedback on her application materials. These types of support ultimately enabled Michelle to accept a postdoc position.

Similar to students interested in industry, those interested in the academic path benefited from advisors fostering their ability to pursue their interests and develop skills. When asked why he felt he was chosen for the postdoc position he ultimately accepted, Dustin described how his PI's advising style was integral. Specifically, the fact that his advisor gave him “a lot of independence” to explore his own interests sparked his fascination in a new and niche topic. Through this work, “it became very clear that there was a hole in the literature that could be filled [...]” Dustin targeted his job search toward positions that would allow him to explore these interests further and ultimately accepted a position as a postdoc. He noted that while the advisor was not helpful in terms of securing the specific position, the advisor was:

Always really supportive of me finding a place to go [...] he has an open door policy where if you ever need to discuss with him you can, and you can discuss anything from big picture down to the very small detail.

Dustin thus had both the flexibility and independence to pursue his interests and the support to ask questions as needed.

In addition to allowing Dustin the freedom to explore his scholarly interests in the lab, his advisor provided concrete assistance by sharing a sample letter of recommendation with his new postdoctoral supervisor. During initial conversations between Dustin and his current postdoc supervisor (before he was officially a member of the lab), they discussed the possibility of him applying for postdoctoral fellowships. Because the postdoctoral supervisor was a new PI, he had never written a letter of recommendation before. To assist in the process, Dustin requested that his graduate school advisor provide a sample recommendation letter. He recounted:

My PhD advisor was happy to provide my postdoc advisor with a letter and also additional information. Not only did that happen so that was a very important selection, meaning I think he bolstered or supported much of what I was communicating firsthand to my postdoc advisor

[about] my personality type and my skillsets and all of this stuff. He was able to corroborate those things and who I was in our lab at the time.

Thus, when students are asked about the role their advisors play in the job search process, they do not think only about the job market-specific activities – such as getting guidance about specific labs or writing letters of recommendations, but also about the opportunities afforded them, whether to pursue particular types of research or to pursue internships and summer opportunities. They see these activities as central to developing the skills they will need to be successful on their specific career path. Being a supportive advisor is not only partially about specific activities at the time of the job search but more generally about the longer arc of graduate education and the kind of professional support students receive throughout their studies to prepare for their careers.

Unsupportive advisors. In the same way that supportive advisors facilitated skill development, in addition to providing more specific job-related support, unsupportive advisors were typically not involved in the job search process and, more generally, have not been supportive throughout students' graduate school journeys. Advisors in this category were not supportive at times because they disagreed with the career path students decided to pursue or because they had an overall negative or tense relationship.

For example, Corinne described how, as she got closer to graduating, she became more direct in not taking on additional, unrelated work from her advisor. When asked to take on additional tasks, she became more assertive in saying “no.” This led to growing tensions with her advisor. Talking about her advisor, Corinne shared:

This year it's been a lot more antagonistic, and I don't know if it's because I've been pushing back on him more [...] the main thing I've learned from working with my advisor [...] is how to deal with people like him in science that just have unrealistic expectations.

Given the tensions, the advisor was not involved in her job search. To search for jobs, Corinne primarily used resources provided through her university's career center, explored job ad websites and emailed professors whose labs she was interested in joining.

Similarly, Carmen detailed an ongoing negative relationship with her advisor that impacted her mental and emotional health, contributed to her discomfort in the lab, and was an impetus to her striving to graduate as soon as possible (she completed her program in record time – less than four years, surprising even some faculty within the department). Eventually, Carmen's mistreatment from her advisor led her to file a judicial affairs report. As Carmen explained:

She was very verbally abusive, tried to sabotage me and stuff [...] being in such a horrible environment, it really lit a fire under me [...] I hustled to get out of there because it was horrible for my mental health [...] Literally, pick an HR rule, and she broke it, other than sexually assaulting me.

Given the fraught relationship with her advisor, Carmen could not rely on her to offer any type of support during the job search process. While Carmen was fortunate to have other committee members who provided general emotional and mental support during graduate school, she was essentially on her own during the job search process. After researching which labs she was interested in joining as a postdoc, she sent emails to those PIs asking if there were any openings in their lab. She ended up finding the perfect fit and is now working as a postdoc in a lab she is satisfied with.

In some instances, the relationship with advisors was not distinctly negative, but advisors were not invested in supporting students through the transition to full-time employment. When asked about her advisor's support during the job search process, Karen

explained she had “close to none.” She provided an example of attending a major disciplinary conference, and her advisor “provided very, very little support” and barely introduced her to anyone at the conference. Moreover, Kara had an advisor who simply did not agree with her desire to pursue non-academic career paths and thus was not helpful during the job search. As Kara detailed, he had prepared her for a “career path to follow his footsteps [...]” and she was interested in pursuing a different path. When Kara learned about an opportunity to work part-time for a small company and asked her advisor if she could have flexible hours to pursue this, her advisor told her that she could not. Regardless, Kara decided to work for this company and gain what she felt would be relevant industry skills. For her, this was something she “felt [she] had to do against his wishes.” At the time of the interview, Kara described this experience interning with a start-up company as key to her getting the most interviews for the industry careers she was pursuing. Thus, while supportive advisors facilitated students pursuing opportunities to develop skills for their specific career interests, unsupportive advisors did not.

Sponsorship advisors. On the opposite end of the spectrum from unsupportive advisors were sponsorship advisors. These advisors went beyond providing general support for skill development and job market advice. They were more directly engaged in terms of leveraging their networks inside and outside of academia to support doctoral students’ transitions to full-time employment.

Veronica described how her advisor “[...] was the one that open[ed] the door [and] put me in contact with that person [...]” Specifically, her advisor introduced her to a person who Veronica collaborated with on a research project. After graduation, she joined that collaborator’s lab. Moreover, her advisor’s role during the job search was not limited to the social connection provided. Veronica also mentioned receiving guidance and support in navigating the process. Although she was very interested in potentially working with this collaborator as a postdoc after graduating, Veronica detailed how she felt nervous asking her. The advisor provided her with emotional support, strongly encouraged Veronica to ask the collaborator for what she wanted and assured her that it would be okay.

While Veronica’s connection was facilitated through an academic collaboration, Jane’s was facilitated through an industry connection. Supporting Jane’s interest in pursuing an industry career and acknowledging that the skills she would need to be successful in that space differed from his expertise, her advisor “brought a second mentor who had a partial affiliation with the university, but was fully employed at a pharmaceutical company in town.” It was through resume edits and mock interviews that Jane was ultimately offered (and accepted) a position working at this secondary mentor’s company. Like Veronica, Jane’s advisor did more than forge a connection that led to a job opportunity. He also provided guidance and support throughout the process. Jane detailed how her advisor “acted as a sounding board,” was “unbiased,” and helped her “process a lot of the information” when she shared her experiences interviewing for different companies. Jane’s advisor offered support throughout the process, which helped her build skills and confidence for the next steps after the PhD.

While it could be expected that faculty advisors are more likely to support students who pursue academic career paths, whether because of their knowledge base or bias toward academia, we found only relatively small differences in advising styles across students’ career paths. Approximately half of the students on academic and non-academic tracks reported having supportive advisors. Only a slightly higher percentage of students pursuing academia had sponsorship advisors (25% of students on the academic path vs 16% on the non-academic path). Given our small sample size (with 28 students pursuing positions in academia and 19 in non-academic settings), dividing students across advisor types means that 1–2 students can notably impact percentage distributions. Future research would

benefit from further investigating the relationship between advisor support and different career trajectories.

After the PhD

Beyond faculty advisors

While advisors played an important role in the job search process for most students (apart from unsupportive advisors), students relied on other individuals as well. Overall, 79% of students ($n = 37$) reported engaging with individuals beyond their advisor during the job search, including 83% of students with supportive advisors, 69% of students with unsupportive advisors and 80% of students with sponsorship advisors. Relying on other individuals was thus not a substitute for advisor support but worked in tandem with that support as students navigated transitioning into full-time employment. If anything, students who had unsupportive advisors were also slightly less likely to leverage other connections as well. We purposefully use the word connections as opposed to relationships since, as the data below will highlight, many of the individuals who students engaged with do not share a close connection implied by the word relationship. When examining these connections beyond the advisor, two main categories emerged: relationships that were either facilitated and/or supported by their program or university and those that were independently sought by the students.

University facilitated connections. Harold solicited assistance for the job search during his participation in a university-wide fellowship. It was through this fellowship that Harold developed his skillset and was able to gain concrete work experience. In addition to participating in this fellowship, he was also involved in a university-wide program that exposed students to alternative career paths outside of academia. Through this program, he met a person who was a patent agent, a career Harold decided to pursue. When asked why he thought he was offered the job, Harold replied:

A hundred percent of someone that I know (laughter). It was all through connections [...] it very much was one of my good friends is an attorney at the law firm that I work at. He introduced me to someone in their intellectual property department [...] he kinda put in a good word with me with some of the partners [...].

While Harold's network connections were facilitated through his participation in distinct programs supported by the university, other students relied on their relationships with committee members. For example, Deanna received career support from her dissertation committee members. While none of them had expertise in her specific research area, they reached out to their personal contacts who were working in her field of interest. The position in a postdoc lab that Deanna ultimately accepted was facilitated through a committee member's connection. She described her committee member and the current postdoc PI as "good friends."

In addition to committee members and university-sponsored programs, students were exposed regularly to researchers from other universities via seminars and other events, which some leveraged for job opportunities. For example, Nadine leveraged a connection to a seminar speaker. She was made aware of her current postdoc position by a postdoc who worked across the hall from her graduate school lab and circulated a posting on LinkedIn. When looking into the position, Nadine realized the lab was directed by someone who had previously been a speaker for a seminar she attended. She:

Reached out to him and [...] shared with him some of my ideas, and he got excited about some of my ideas too and said they really aligned with things he has in mind for goals. We just hit it off.

Nonuniversity facilitated connections. Students also often used connections unaffiliated with their research labs or institutions. Sometimes these connections were accessed through discipline-specific conferences, student outreach or family and friends. Milly secured her job through someone she met at a conference. Milly described how, when she was at a conference, she met this person “who was a previous fellow [at her current job and in the same department].” She went on to describe how “He was the one that helped me figure out how to apply. Then he talked to people that were in the program, as well.” When asked why she felt she was chosen for the position, she replied “I do think, as much as I hate to say it, I think knowing people that were here before definitely helped.”

Though Milly benefited from personally meeting and connecting with someone for her job search, Terry approached the process differently. While searching for a postdoc, Terry researched a professor she was interested in working with and emailed her to ask if she had availability in her lab for a new postdoc. According to Terry, this professor “didn’t have a position available, but she knew a professor that was looking for a postdoc, and she put me in contact with them.” That this professor, who had no relationship with Terry but was nonetheless willing to refer her to another lab, provides insight into how even far-removed connections could provide assistance to students during their job search process.

Sometimes non-university facilitated connections were particularly useful if a student hoped to transition into an industry career. This was the case for Jennifer, who benefitted from her relationship with a friend’s father. According to Jennifer, she had “[...] a friend whose dad work[ed] at a biotech company.” She reached out to him and expressed her interest in learning more about working in industry. According to Jennifer:

He put me in contact with other people who then got me in contact with other people. I ended up doing close to 10 to 12 informational interviews with a bunch of different people who worked at different companies, who had very different life trajectories at these companies. I think it was at that point that I can see that my own personal trajectory could fit into industry [...] it was like my own personal journey of having these interviews that actually made it more clear to me how I could be in industry instead of just staying in academia.

While advisors in general offered valuable assistance in the job search process, whether by providing general support or leveraging their networks, the vast majority of students also relied on connections beyond their advisors. Broadly conceived, “chance” might play a role when students come into contact with individuals who can offer valuable information by being in the right place at the right time (Mitchell *et al.*, 1999). At times those connections were mediated through university activities, whether specialized programs or speaker series, and at other times, they were individuals without any connection to the university.

Discussion

While prior literature documents the importance of faculty advisors for graduate student experiences, presented findings illuminate how advisors contribute to the job search process. The data based on a sample of biological sciences PhDs in the US, show a range of advisor roles from providing no support to offering sponsorship by leveraging their networks on behalf of students. Notably, when asked about ways in which advisors supported their job search process, most students did not think only about the specific activities at the point of transition to full-time employment but about the accumulation of opportunities they had along the way to develop skills and prepare for transition into a career. Supportive advisors offered generalized assistance rather than job-specific advice, which was greatly valued by students, who deemed such support integral to their job

search. Thus, career assistance is not a discrete set of activities at the point of looking for a job but a long-term investment in a doctoral students' professional future.

The data also illuminate another negative impact of poor student-advisor relationships. Much prior research has noted that students who do not have a good relationship with their advisor are more likely to leave their programs (Bair and Haworth, 2005; Barnes, 2010; Lovitts, 2001; Ruud *et al.*, 2018). This study demonstrates that even if students persist through their programs, poor advising relationships mean that students are left largely on their own during the job search process and must navigate this transition without the support of a critical mentor they have worked with for many years. Moreover, they not only lacked direct assistance at the point of transition but oftentimes were not supported in developing the skills that would strengthen their candidacy for their chosen career paths.

Presented results corroborate recent calls to move beyond the dyadic student-advisor relationship and acknowledge a broader range of influences (Burt, 2019; Gardner, 2007; Mantai, 2017). The job search process benefits from a constellation of connections beyond the advisor. More than three-quarters of students relied on other individuals in their job search process and that was the case even when they had supportive or sponsorship advisors. Students often leveraged not only relationships they built through university-affiliated programs and events but also those beyond the university community. Students were often quite agentic in pursuing information and opportunities, sometimes benefiting from the insights and assistance from those they have barely (or never) met.

These findings have important implications for how doctoral programs can support successful career transitions. Faculty advisors continue to serve as critical developmental resources for doctoral students beyond degree completion, yet students may receive vastly different levels of support related to their transition to full-time employment. Advisors are only able to offer assistance inasmuch as they have access to the types of information and relationships that would be valuable to doctoral students. Crucially, this support may be directly or indirectly shaped by departmental and institutional policies (e.g. Pinheiro *et al.*, 2017; Seo *et al.*, 2021). Therefore, programs and institutions play an important role in shaping the context within which advising occurs. To support career transitions, graduate programs should cultivate cultures of robust faculty mentorship for their doctoral students while emphasizing long-term investment in students from coursework to the career, including formal policies that outline the advisor's role in career preparation. Moreover, graduate programs should encourage faculty to direct students to other offices on their campuses that can provide appropriate support, especially to those pursuing paths outside of academia (Skakni *et al.*, 2022). Universities could also better support students by providing programming that teaches students how to successfully transfer their academic skills to non-academic environments, collaborate with interdisciplinary teams and distill research to wider audiences (Nerad, 2015).

In addition, the presented findings underscore the significant role of other relationships in the lives of doctoral students searching for professional opportunities after graduation. Graduate students thus need to be encouraged and provided opportunities to network broadly and nurture relationships beyond their primary advisor (Sweitzer, 2009). Finally, graduate programs should think more critically about ways to bridge doctoral training and professional academic communities. Connections to the academic field should be encouraged and incubated through consistent participation in professional activities, degree requirements that synergize with professional competencies, and opportunities to build relationships with professionals working in a variety of contexts (e.g. Burt, 2019; Sverdlik *et al.*, 2018).

As this was an exploratory study, the findings offer an overall landscape of doctoral students' experiences during the job search process. However, a few limitations are worth nothing. This study is focused on a specific discipline. That is beneficial for the purposes of

this study since labor market conditions, availability of opportunities inside and outside of academia, as well as one's ability to leverage networks vary across fields. However, this also limits generalizability of the presented findings. Future research would benefit from extending this work by examining the role of advisors and other individuals in the job search processes across disciplines, especially beyond the lab sciences.

Moreover, this study is based on interviews with graduate students and not their advisors. In addition to the students' accounts provided in this study, future research would benefit from also interviewing advisors to develop a more holistic understanding of the ways that advisors and students interact throughout the job search process. Relatedly, the impact of advisors may go beyond the tangible supports they provide. Unsupportive advisors may also impact students' self-confidence and well-being (Breen *et al.*, 2024), which can shape their job-search process – an area that deserves attention in future research.

As students increasingly pursue jobs outside of academia (NCSES, 2022), the extent to which their graduate programs provide opportunities for developing skills and building relationships beyond academia is likely to become more salient, especially in fields with less congruence between the skills developed during graduate training and alternative career options. Future research may also examine the interplay between doctoral students' career aspirations (e.g. academic vs non-academic paths) and their relationships with advisors and other individuals during the job search.

Finally, the current study focused on the US context, which reflects specific assumptions about labor market participation and doctoral program degree structures. Students in the present study were enrolled full-time in their programs. The role of faculty advisors in the job search process may look very different in national contexts where students are working while pursuing graduate school part-time. Part-time doctoral students may find it more difficult to build and maintain relationships with faculty (Zahl, 2015), and faculty advisors may be less knowledgeable about specific needs of part-time students (Mills *et al.*, 2014). Furthermore, students in this study were on average 31 at the point of transition to the labor market, which is close to the US average (NCSES, 2022) but considerably younger than the average age of students completing doctoral degrees in other countries (Else, 2007; Molla and Cuthbert, 2015; Neumann and Tan, 2011). The younger age of doctoral students transitioning into full-time employment in the US, relative to other countries, suggests that these students also have less labor market experience in general, and this likely has important implications for their job search experiences. Future research would benefit from examining how employment history, before or during the PhD, may shape students' experiences transitioning into full-time employment upon degree completion.

Overall, future research on graduate student socialization would benefit from dedicating more attention to doctoral students' transition to full-time employment post degree completion. Throughout the socialization process, students undergo a developmental journey from novices to professionals as they learn skills, knowledge and practices of their discipline and prepare for their future careers. While having appropriate skills and knowledge is crucial, transition to the job also requires engagement with individuals both near and far in pursuit of suitable career opportunities. Attention to the job search process has the potential to enrich socialization research by both illuminating another important role played by faculty advisors as well as extending the work by highlighting the importance of developing a constellation of connections for success in graduate programs and beyond.

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