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Cohort-based programs facilitate skill development and community building for postdoctoral scholars: a pilot study

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Postdoctoral scholars (“postdocs”) occupy a distinct academic stage and therefore have unique career and professional development needs. We aimed to explore whether a cohort-based program could promote skill development, support career preparation, and facilitate community building among postdocs at our institution. We applied the design thinking process, commonly used in engineering and industrial design, to create a 4-month long leadership and project management program. Pre- and post-surveys with Likert-scale questions measured participants’ self-confidence in and self-assessment of competencies related to leadership and project management (e.g., creating an inclusive environment, developing a project charter). Fourteen postdocs from STEM and humanities disciplines participated in the pilot program. Matched responses from participants indicated an 82% positive shift in leadership self-confidence ($n = 11$) and a 56% positive shift in project management self-confidence ($n = 9$). Postdocs also showed a positive shift in all 12 competencies related to leadership ($n = 11$), and a positive shift in nine of 10 competencies related to project management ($n = 9$). In the optional open-ended questions provided in the surveys, postdocs articulated that the cohort created an environment to share experiences, safely practice new skills, and discuss their career goals. Applying the principles of design thinking to develop a cohort-based professional development program resulted in participant learning gains and their feedback suggests that the program supported a greater sense of belonging. Administrators could use our approach to innovate programming that meets the professional and personal needs of postdocs at their institution.

KEYWORDS

postdoctoral scholar, cohort-based program, professional development, community building, career preparation, leadership, project management, design thinking

1 Introduction

Postdoctoral scholars (“postdocs”) occupy a liminal space in higher education between graduate students and faculty. Due to variability in appointment lengths and high turnover rates, postdocs may lack connections to build a network of peers and mentors, have limited bandwidth for career planning, or feel uncertain about career prospects

(van der Weijden et al., 2015). Individuals with marginalized identities face additional barriers, such as immigration constraints, culture shock, financial hardship, bias, and isolation. These challenges impact multiple levels, including individual wellbeing, a sense of belonging within a department, and retention at an institution (Woolston, 2020).

In contrast, many factors can contribute to a positive postdoctoral experience. Perceived mentor support is a strong predictor of postdoc satisfaction, for example (McConnell et al., 2018; Van Benthem et al., 2020). Positive faculty mentors and mentor networks (Hernandez et al., 2023; Holcombe and Kezar, 2019) can increase the integration, persistence, and advancement of all postdocs, but especially for individuals from historically marginalized groups. Cohort-based courses or programs can also boost career readiness, increase diversity, and improve retention (Eisen and Eaton, 2017; Layton et al., 2020). However, cohort models are often designed to support individuals through transitional phases (e.g., undergraduate to graduate or postdoc to faculty; Culpepper et al., 2021; Fernández et al., 2024). There is a need to investigate whether cohort models during an academic stage could have similar positive effects (Van Wart et al., 2023).

Offices that serve graduate students and postdocs often focus on providing career and professional development, given that doctorate holders are increasingly entering other sectors (Kahn and Ginther, 2017; Sauermann and Roach, 2012; Denton et al., 2022). Program models exist for graduate students and postdocs in biomedical research, with many emerging from the National Institutes of Health's Broadening Experiences in Scientific Training (BEST) initiative (Meyers et al., 2016). Their work and others found that at the graduate level, participation in these opportunities has no measurable impact on research productivity (Brandt et al., 2021), can lead to knowledge growth (Steen et al., 2021), and support career discernment (Chatterjee et al., 2019). However, it can be a challenge to develop and offer programming that both drives engagement and is broadly applicable.

Design thinking uses a human-centered approach to develop solutions that address a need for a group of people (Auernhammer and Roth, 2021). Commonly used in the fields of engineering and industrial design, the steps include *empathizing* with the target audience, *defining* the need, *ideating* solutions that address that need, *prototyping* products, and *product testing*. The process is non-linear and encourages jumping between and reiterating steps as feedback from the target audience is obtained. Design thinking could support administrators with developing and adapting programming that postdocs will find relevant and worth attending.

The Office of Postdoctoral Services at the Georgia Institute of Technology (Georgia Tech) sought to explore whether applying a design thinking process would result in a cohort program for postdocs that would support their skill development, boost confidence in taking next career steps, and build community. To achieve this aim, we interviewed and received feedback from current postdocs throughout the program development process and report on how the experience did or did not meet their personal and professional needs.

2 Methods

2.1 Local landscape

Georgia Tech supports an average of 350–400 postdocs, with ~50 and 30% residing in the College of Engineering and Sciences, respectively. The remaining 20% of postdocs reside in the Ivan Allen College of Liberal Arts, the College of Computing, the College of Design, Scheller College of Business, and other research centers on campus. Research conducted by our postdocs spans the sciences and humanities. While biomedical research is not a focus at our institution, there are disciplines that conduct related research in the schools of biomedical engineering, biological sciences, chemistry and biochemistry, and others.

2.2 Needs assessment

Our first step was to review climate survey data collected in 2019 ($n = 175$). In response to the statement, “I feel isolated in my school/unit or lab, with few opportunities to network with Georgia Tech colleagues,” 37.7% (66/175) of postdocs chose “agree” or “strongly agree” on a 5-point Likert scale ranging from “strongly disagree” to “strongly agree.” On a multiple choice question with 15 options (Supplementary Table 1), we asked, “Which of the following career and professional development resource/programs would you take time to participate in? Please select up to five of your top choices.” After grant writing, job search skills, and teaching at the college level, the next highest categories were leadership training (7.2%), selecting the best career option(s) (6.8%), collaborative/team research (6.6%), and managing personnel (4.6%), respectively. These percentages reflect the number of times an option was chosen out of 696 total votes.

2.3 Program development using design thinking

Based on the 2019 survey responses, we applied the design thinking process (Auernhammer and Roth, 2021) to develop a program that would address isolation and help postdocs develop leadership and project management skills.

2.3.1 Empathize and define

During spring 2022, we invited postdocs on our communications platform to participate in interviews. The COVID-19 pandemic may have impacted postdoc interests and concerns, and we wanted to determine whether the needs assessment findings from 2019 were still applicable. We received five responses, and conducted in-person and virtual interviews to gain a holistic perspective of current postdocs' experiences, needs, and career goals (<https://osf.io/v7f8z>). Despite being from different disciplines (e.g., industrial and systems engineering, literature and communications, and biology), interviewee responses aligned with the 2019 survey responses, and further highlighted postdocs wanted to discuss challenges with peers outside of their school and

unit. Moreover, scholarly work was almost always prioritized over social events, and interviewees stated that attending a workshop series with the same group would feel like time was well-invested.

2.3.2 Ideate

We chose existing professional development programs, the Leadership and Management in Action Program (L-MAP; Heckler et al., 2021) and the Academy for Transferable Skills (ATMS; McKinney et al., 2021), for our curricula. These programs were developed for graduate students and postdocs in the biomedical sciences and have been successfully implemented at other institutions. Although the Georgia Tech postdoc population is not majority biomedical sciences, administrators who had implemented L-MAP and ATMS stated that the programs could be generalized for a wider audience.

2.3.3 Prototype

After confirming the curricula, we quickly generated program outlines in Microsoft Word for four different formats: (a) asynchronous virtual, (b) synchronous virtual, (c) synchronous hybrid, and (d) synchronous in-person. Five of 11 postdocs who had participated in previous programming through our office agreed to give feedback on what they liked about each option and what barriers they anticipated to participation (<https://osf.io/pwu92>). Interviewees shared that asynchronous work would not be prioritized, and it would be difficult to focus during synchronous virtual or hybrid sessions. All interviewees preferred a synchronous in-person option *only if* their peers would show up consistently, and requested opportunities to hear from experts.

2.3.4 Test

Based on postdoc feedback, we decided to pilot a 4-month synchronous, in-person cohort-based program during spring 2023. We finalized the program schedule and invited speakers to supplement key topics, such as conflict management, working in teams, and project life cycles (complete program available in the [Supplementary material](#)).

2.4 Participant recruitment

The program application (<https://osf.io/vwu9m>) was initially sent to postdocs who participated in programming through our office, then was opened to all Georgia Tech postdocs. We received 27 applications and used a rubric (<https://osf.io/nb2s4>) to assess applicants' responses to questions related to their professional development goals, career goals, and experience with diversity, equity, inclusion, and belonging. We chose 16 applicants with the highest scores, and 14 committed to the program.

2.5 Program description

We offered a Leadership certificate and Project Management certificate as incentives for program completion. Participants who

met attendance requirements and submitted portfolio items for each portion of the program received a certificate of completion (requirements included in the [Supplementary material](#)).

For the first portion of the program, we implemented L-MAP (Heckler et al., 2021) without modifications. Topics included professionalism and professional identity, leading without authority, negotiation, working in teams, and inclusive organizational structures. Sessions included a review of introductory material, then participants broke out into small groups to share experiences, discuss approaches to unit case studies, and receive feedback on leadership goals. For the second portion of the program, we adapted the ATMS curriculum (McKinney et al., 2021) and tasked the cohort with creating a resource or event that would benefit Georgia Tech postdocs. We taught the design thinking process and used the ATMS framework to teach the project management life cycle. Participants used a design thinking approach to address the charge, and managed their progress using project management principles and tools.

2.6 Program assessment

We received exemption status from Georgia Tech's Institutional Review Board to share participant demographics and their survey responses in aggregate (protocol H24007). Demographic data was obtained from Georgia Tech Human Resources.

2.6.1 Participant demographics

Of the 14 postdocs, seven were from the College of Engineering, three from the College of Sciences, two from the Ivan Allen College of Liberal Arts, and two from research centers on campus. The cohort was 64% female and 36% male, with 57 and 43% coming from international and domestic backgrounds, respectively. Participants were diverse in terms of ethnicity, with individuals identifying as Asian (14%), Black/African American (14%), multiracial (36%), and white (36%). The composition of the cohort closely mirrored the composition of postdocs at the institute level, except we had less representation of individuals identifying as Asian, and greater representation of women and individuals identifying as Black/African American.

2.6.2 Survey design

Survey items were developed directly from the learning objectives of L-MAP (Heckler et al., 2021) and ATMS (McKinney et al., 2021). We administered pre- and post-surveys for each portion of the program (see [Supplementary material](#)).

The pre-survey for leadership had 13 questions. We used a 5-point Likert scale ranging from "Not confident" to "Very confident" to assess individual self-confidence in leadership. We used a 5-point Likert scale ranging from "Strongly disagree" to "Strongly agree" to assess their perceived ability in 12 leadership competencies, as defined by L-MAP learning objectives (e.g., "I understand the professional norms in my field"). We asked six open-ended questions related to their thoughts and beliefs about leadership (e.g., "Define leadership (as you understand it) and the top 3 skills you associate with it").

The post-survey for leadership had 17 questions. We used a 5-point Likert scale ranging from “Not confident” to “Very confident” to assess individual self-confidence in leadership. We used a 5-point Likert scale ranging from “Strongly disagree” to “Strongly agree” to assess their perceived ability in the same 12 leadership competencies, and whether the program content was valuable. We used a 4-point Likert scale ranging from “Unsure/Not applicable” to “Exceeded” to assess their program expectations. We asked eight open-ended questions to explore the impact of the program on their beliefs and approach to leadership (e.g., “What, if anything, will YOU implement, do, or do differently, as a result of attending the series?”).

The pre-survey for project management had 11 questions. We used a 5-point Likert scale ranging from “Not confident” to “Very confident” to assess individual self-confidence in project management ability. We used a 5-point Likert scale ranging from “Strongly disagree” to “Strongly agree” to assess perceived ability in project management competencies as defined by the ATMS learning objectives (e.g., “I can identify potential stakeholders in a project”). We asked four open-ended questions to gain further insight into their knowledge about project management and beliefs about their own project management ability (e.g., “Why do feel the level of confidence that you do about your project management ability?”).

The post-survey for project management had 16 questions. We used a 5-point Likert scale ranging from “Not confident” to “Very confident” to assess individual self-confidence in their project management ability. We used a 5-point Likert scale ranging from “Strongly disagree” to “Strongly agree” to assess their perceived ability in the same 12 project management competencies, and whether the content of the series was valuable. We used a 4-point Likert scale ranging from “Unsure/Not applicable” to “Exceeded” to assess their program expectations. We asked seven open-ended questions to explore the impact of the program on their beliefs and approach to project management (e.g., “After completing the workshop series, what project management skills do you feel you have practiced, developed, or improved? Please be as specific as possible”).

Fourteen of 14 postdocs completed the leadership portion, and 12 of 14 completed the project management portion of the program. We collected 11 matched responses (i.e., participants who completed the pre- and post-surveys) for the leadership portion and nine matched responses for the project management portion.

Due to the small cohort size, we chose to report percentage shifts between Likert scale categories for matched responses only. We did not conduct a qualitative analysis of the optional open-ended questions due to inconsistent and incomplete responses from participants. Instead, we provide testimonials from individuals who provided complete feedback to highlight the potential impacts of the program. While program outcomes cannot be extrapolated to other populations, our framework, approach, and results are intended to be a pilot study for how and why cohort-based programs, developed with a design thinking approach, could be beneficial for postdocs.

3 Results

A major achievement of the program was an 85% retention rate over the 4-month period. Overall, we saw positive shifts in participant confidence for leadership and project management. Testimonials suggest that the leadership and project management curricula introduced important concepts that participants were able to apply and practice with their cohort.

3.1 Leadership

Program participants showed increased confidence in their leadership ability. Specifically, we observed a shift from 18% responding “confident” at the beginning of the program to 100% responding “confident” or “very confident” in the post-survey ($n = 11$, Figure 1). We also saw positive shifts in leadership competencies. The smallest positive shifts were related to envisioning the impact of leadership on their career development, and recognizing ideal or unprofessional workplace norms, behaviors, and environments. Postdocs showed the largest positive shifts in competencies related to leading without authority, conflict management, and negotiation ($n = 11$, Figure 2).

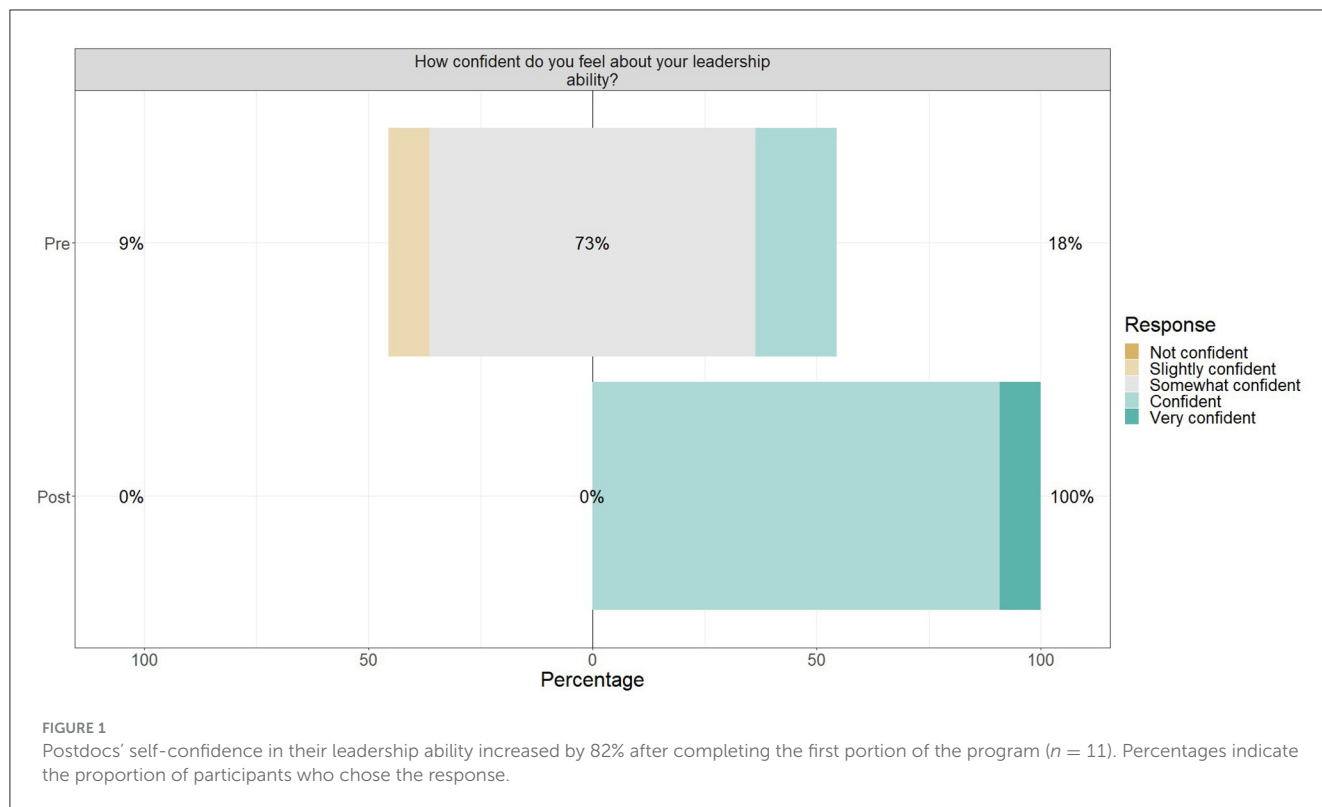
3.2 Project management

The project management portion of the program introduced common tools for team and project management (e.g., team charter, project schedule, and post-project report), but the project itself was postdoc driven. We gave the cohort autonomy to create a shared goal so they could actively practice the leadership skills from the first portion of the program. Through interviews they conducted with current postdocs, faculty, and administrators, the cohort identified a need for and produced an onboarding checklist for postdocs. The Office of Postdoctoral Services refined the document, and it is now a resource on our website (<https://osf.io/2gjf6m>).

Postdocs also indicated a greater understanding of the design thinking and project management process, with a shift from 22 to 78% of participants feeling “confident” in their project management ability by the end of the program ($n = 9$, Figure 3). Positive shifts were also observed for all competencies except for time management ($n = 9$, Figure 4). The largest positive shifts were related to connecting the design thinking process to project management, and creating documents to better manage a team and track the progress of a project.

4 Discussion

A common challenge among offices that serve graduate students and postdocs is identifying and implementing professional development opportunities that will drive engagement across disciplines. By applying the design thinking process ourselves, we involved members of our target population during key phases of program development and were able to create an experience



that met postdocs' personal and professional needs. Recruiting a smaller cohort and scheduling regular meetings maintained an environment where postdocs could build trust, camaraderie, and accountability. The program also attracted and retained postdocs from different fields because leadership and project management skills are transferable to most, if not all career paths (Strubbe et al., 2022).

4.1 Leadership

Program participants showed an 82% positive shift in their leadership ability (Figure 1). This outcome could be attributed to the interactive structure of L-MAP, which uses a flipped classroom approach (Awidi and Paynter, 2019) and employs case studies to prompt discussions among participants. Previous research has shown that case-based learning can increase student interest and collaborative learning in the health professions (Srinivasan et al., 2007; Curran et al., 2008; Leon et al., 2015). Results from studies conducted in biology courses supports that case studies can significantly improve student learning outcomes and comprehension compared to traditional didactic lectures (Bonney, 2015; Rybarczyk et al., 2007). The large shifts in self-confidence from program participants suggest that case studies at the postdoctoral level may have similar impacts. Many participants stated that small group discussions were the most valuable part of the program, with one appreciating “a chance to think through and discuss the material together with other postdoctoral colleagues.”

Positive shifts were observed for all leadership competencies, but especially those related to conflict management, leading

without authority, and negotiation (Figure 2). These units were accompanied by guest lectures from subject matter experts who provided additional activities and references, which may have reinforced ideas and concepts originally discussed in the L-MAP case studies.

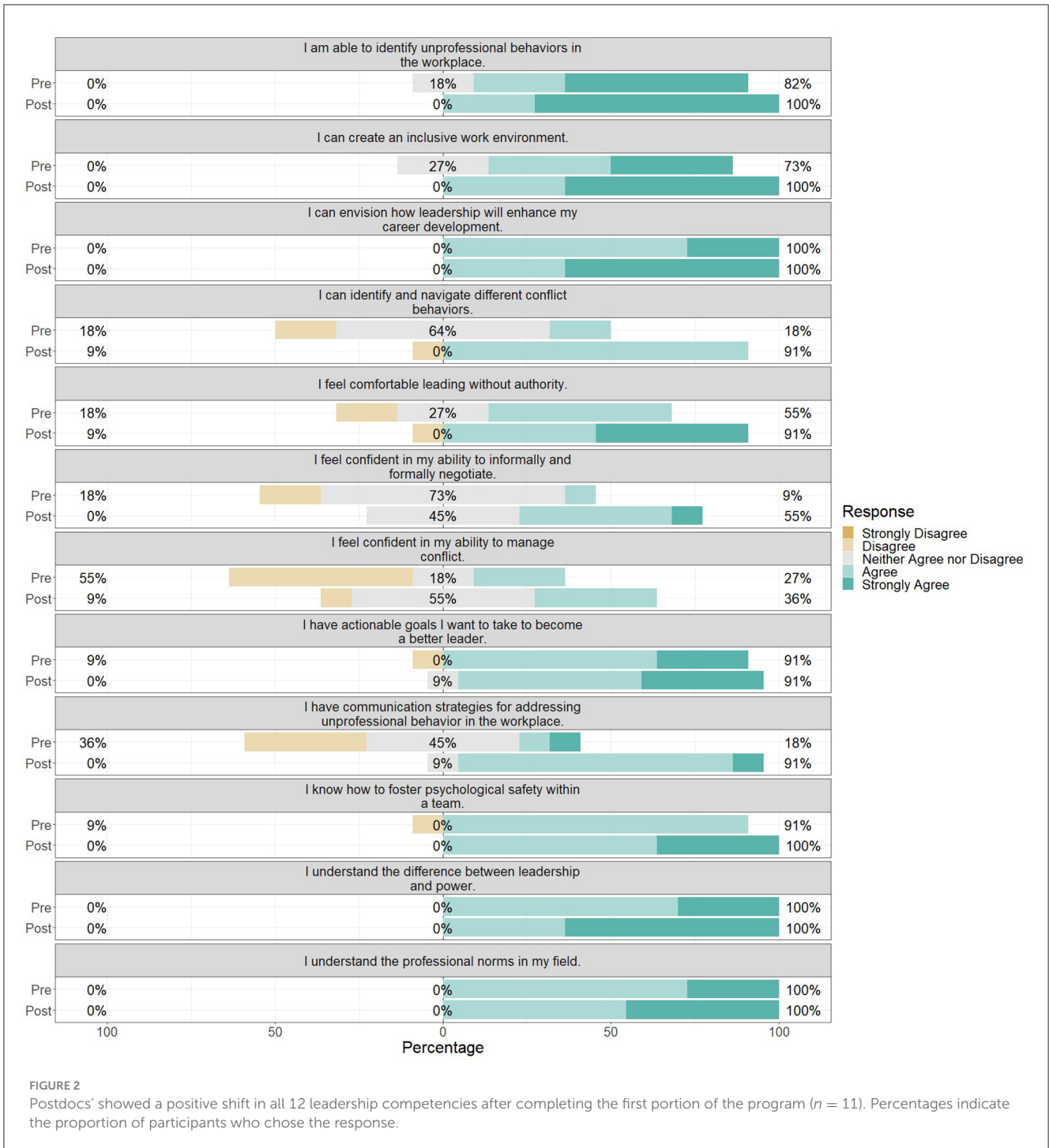
While we did not conduct qualitative analyses to the optional open-ended questions, the testimonials suggest that a cohort experience created a conducive space for participants to feel supported in developing their identities as leaders. One postdoc stated:

The series made me feel more at home at Georgia Tech in terms of meeting peers and having a chance to discuss our experiences and leadership ambitions together. It gave me new vocabulary to think of both my strengths and shortcomings as a potential leader.

Another postdoc shared:

The leadership series has had a profound impact on my personal and professional growth. It has provided me with valuable insights and practical tools that have empowered me to become a more effective and confident leader. Moreover, the series has fostered a supportive and collaborative environment, enabling me to connect with like-minded individuals who share a passion for continuous improvement.

Providing a structured framework for postdocs to discuss and role play scenarios with peers may lead to a greater sense of belonging, increased self-confidence, and enhanced skill building.

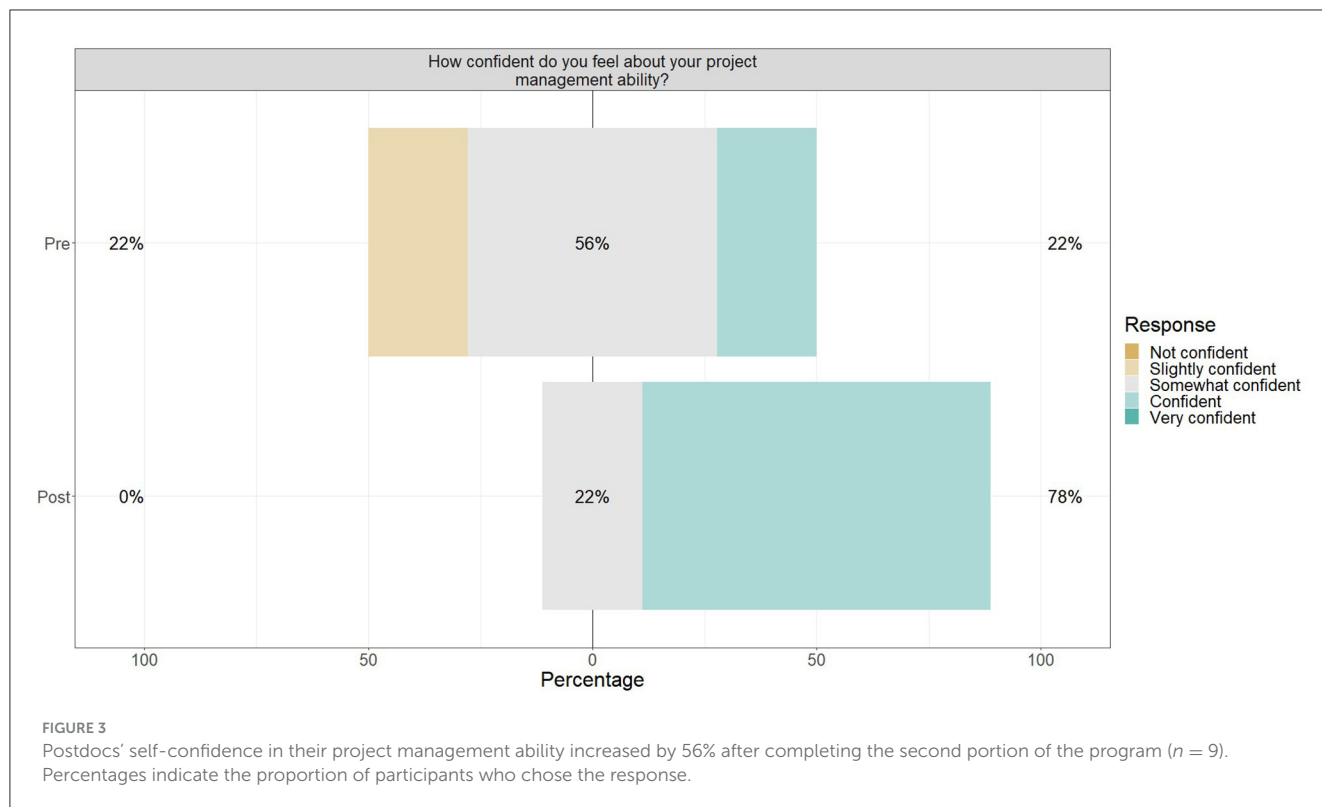


4.2 Project management

Postdocs often learn project management strategies through trial and error, even though there is growing recognition that formalized training for such skills are needed for successful transitions into to faculty (McAlpine, 2015) and leadership positions in general. It was therefore unsurprising that the post-survey data showed a 56% positive shift in self-confidence (Figure 3), given that most participants had not received prior project management training. Competencies related to

understanding the design thinking process and developing documents such as a team charter, project charter, and risk register showed the largest shifts (Figure 4). These tools and approaches were new to most participants, so we provided templates for them to complete, thereby boosting their ability to apply the same principles to future projects. Time management remained relatively unchanged, likely because postdocs have honed this skill throughout their career already.

In response to what was most valuable about the project management portion of the program, a postdoc remarked:



Having the opportunity of working with people with a very different background as a team. Also, not having a clear project from the beginning and navigating in the uncertainty, gives you some perspective about how to manage a project since the very beginning.

Another participant shared that the program “provided me with essential and transferable skills in project management.” By having the cohort complete a non-research related project together, they were able to apply leadership and project management skills in an entirely new context, which resulted in learning gains. Our results echo those of [Nowell et al. \(2020\)](#), who surveyed postdocs to rate the usefulness of attended professional development opportunities at their institution. Project management offerings were rated as second most useful, and a respondent reflected that they could apply project management skills toward any career.

4.3 Study limitations

The small cohort size limits the generalizability of our findings. We cannot say that the positive shifts observed were statistically significant changes nor that belongingness increased in a measurable way, especially for individuals with marginalized identities. However, the large positive shifts observed in combination with participant testimonials strongly suggests that our program increased individual self-confidence in leading

teams and managing projects, and some participants valued the interactions and support they received from the cohort.

In addition to the positive feedback and outcomes of the program, the cohort provided suggestions on areas to improve. For example, L-MAP was originally developed for graduate students and postdocs in the biomedical sciences and the case studies heavily focus on scenarios within laboratory research settings. A participant requested that future iterations include “a variety of scenarios to think about... The power dynamics of principle investigators (PIs) and social structures of research labs are very academia or STEM centric and not everyone will go into academia.” In the future, featuring case studies from different disciplines and working environments might resonate with a wider audience and increase our impact.

The project management portion of the program occurred from May through June 2023, and sessions were comprised of traditional didactic lectures and active working time for postdocs. In-person attendance was inconsistent due to summer travel, and the cohort assigned tasks asynchronously. In the post-survey, participants recommended avoiding summer months, offering more synchronous working time, and providing more time to learn and apply the content because the tools were new.

Leading without authority, conflict management, and negotiation were the leadership competencies that showed the greatest positive shift. Since the program, we have partnered with the Effective Team Dynamics Initiative (<https://etd.gatech.edu/>) at Georgia Tech to offer standalone workshops on effective communication and conflict management. Future workshops on leading without authority and negotiation are in development.

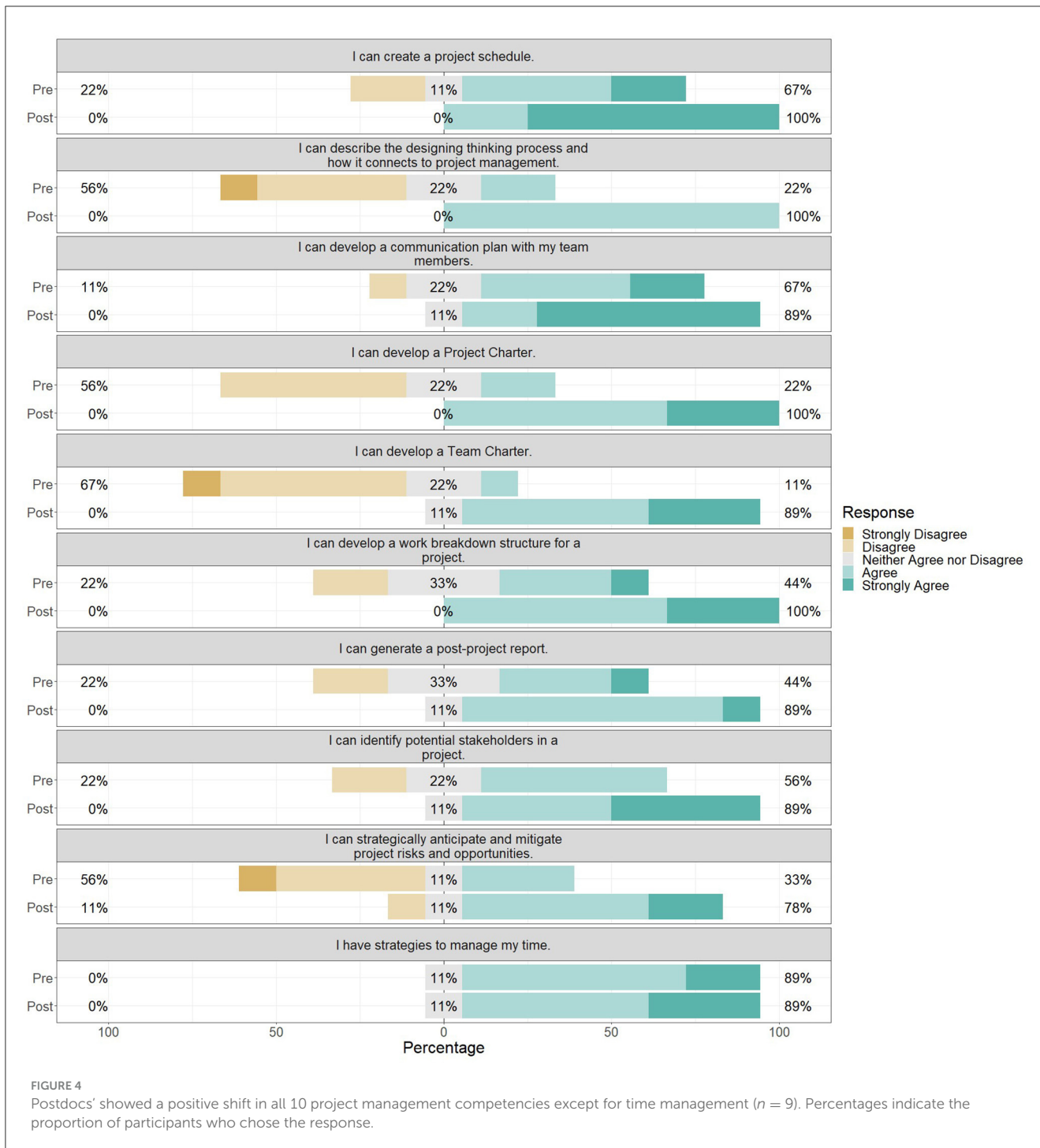


FIGURE 4 Postdocs' showed a positive shift in all 10 project management competencies except for time management ($n = 9$). Percentages indicate the proportion of participants who chose the response.

The next iteration of this program will use data from a climate survey conducted in spring 2024 to identify new skill development areas. We will collect demographic data on other axes of identity (e.g., gender identity, sexual orientation), include a belongingness scale (Malone et al., 2012), and add free response questions to assess the impact of a cohort model on isolation and belongingness in anonymized pre- and post-surveys. Because we saw the value of small cohort interactions, we envision that multiple groups could be run concurrently to maximize impact and increase engagement.

4.4 Implications

Our program supports growing evidence that cohort-based programs during the postdoctoral stage can promote reflection, build community, and prepare postdocs for their next career steps. Postdocs value time and space for personal reflection and peer interactions, as these opportunities are often lacking in their day-to-day schedules (Hokanson et al., 2019). Participation in structured career development opportunities can increase career readiness

(Layton et al., 2020; Steen et al., 2021) and peer mentorship can provide social and emotional support that postdocs may not receive within their research groups.

For individuals from historically marginalized groups, interacting with peers outside their discipline can offer a non-competitive and non-judgmental space to brainstorm solutions to challenges, share experiences, and discuss career plans (Williams et al., 2017). Indeed, we observed how trust was built through the sharing of similar lived experiences, openness to hearing different perspectives, and consideration of how different intersections of identity can inform what challenges seem most salient during the postdoctoral stage. Cohort-based programs create community that is needed at all stages of academia, but their marked effect on retention of individuals from marginalized groups merits wider implementation across different career and professional development contexts, disciplines, and institutions (Fernández et al., 2024; Williams et al., 2017; Hinton et al., 2020; Woods et al., 2023).

Future work should investigate the differences between cohort-based programs developed with or without the intended target population. For example, Steen et al. (2021) co-designed a professional development curriculum with postdocs and found that structured learning with a cohort leads to greater recognition of knowledge and growth compared to non-participants. We took a similar approach and achieved comparable outcomes, which is highlighted by the following postdoc testimonial after program completion:

Participating in the program greatly improved my self-awareness and self-confidence and provided tools to help me with deal with some anxiety associated with my role as a postdoctoral fellow... through the sessions on Leading and Management, and the leadership opportunities inherent in the Project Management section, I saw a significant difference in my approach to daily duties and thinking about my long-term goals. It also helped that the Office of Postdoctoral Services chose an amazing group of postdocs who were vulnerable enough and so willing to share of their experiences and expertise.

As the field of career and professional development for graduate and postdoctoral training continues to grow, our work is an example of how postdoc involvement during program development can drive engagement across disciplines. Design thinking courses or workshops may be offered through engineering or business schools, and we encourage administrators to explore whether this process could spark creativity and innovation in how they adapt or develop future programming. Ultimately, we found that a cohort model provides postdocs with needed peer-to-peer mentorship and support while allowing them to develop transferable skills for any future career.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found at: <https://osf.io/7q5tx/>.

Ethics statement

The studies involving humans were approved by Institutional Review Board at the Georgia Institute of Technology. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

KN: Conceptualization, Data curation, Funding acquisition, Investigation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2024.1474044/full#supplementary-material>

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