Role of industry-university partnership in STEM graduate training: industry mentors' perspective

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Abstract

Driven by the fact that a great majority of STEM PhD graduates will be employed in non-academic jobs, primarily in industry (defined broadly to include private corporations, national labs, defense organizations, etc.), there is a growing recognition that the present format of doctoral training does not prepare them sufficiently for a career outside academia [1, 2]. In response to this need, recently a new student-centered model of STEM doctorate, Pasteur Partners PhD (P3), was developed based on use-inspired research [3]. Industry-university partnership is a requirement of this model, which calls for concerted participation of industry experts in the training of students through identification of industry-relevant research problems, co-advising about how to approach their practical solutions, and training for other non-technical skills that are crucial for success in industry.

An assessment of student demand and their experience with P3's non-traditional features, support of university administration, and the challenges felt by interested faculty advisers during its implementation at Lehigh University were presented previously [3, 4]. This paper completes P3 program's assessment by analyzing the feedback provided by industry scientists who have served as co-advisers to students. The specific objective of the present study is to establish not only the benefits to students but also the advantages these collaborations offer to the industry researchers themselves as well as their organizations. Accordingly, we solicited feedback about the experience of the industry co-advisers from serving as mentors of P3 fellows.

Briefly, the mentors were generally positive about their engagement with students as research advisers and hosts for experiments in their labs. The mentors from national labs were especially appreciative of the opportunity to expand the scope of their own research program as a result of these interactions. They also highlighted the effectiveness of pre-program internships in fostering long-term research productivity, as well as the training provided in the corresponding courses such as project management. With regard to improving the program, the industry mentors expressed a desire for clearer expectations regarding their role in mentoring students, particularly when students return to university. A detailed analysis of the feedback provided by industry mentors and its implications for further improving the P3 model, indeed the state of STEM doctoral training, are presented.

The conclusions of this study are expected to have broad impact beyond the P3 model as they provide valuable insight into the mutual benefits of industry-university partnership for doctoral education.

1. Introduction

There is growing recognition within the graduate education community that the present format of doctoral training does not prepare students sufficiently for a career outside academia [1, 2, 5, 6]. The origin of the gap between the typical graduate training of STEM graduate students and expectations in their subsequent career arises from the fact that the former was designed to prepare the next generation of professors following WWII, whereas today's graduates are more likely to be employed outside academia. For instance, according to the latest available statistics, in 2023 nearly 90% of engineering and physical sciences doctorates who did not proceed with postdoctoral studies were employed outside academia [7]. In fact, about 80% of these graduates were employed in industry and business – the predominant employment sector for new graduates (see Fig. 1). The trend of fraction of positions in industry has been growing consistently in recent decades. In this regard, we note that as early as 1995 the National Academies of Science and Engineering, and the Institute of Medicine, recommended a change in graduate programs at the level of university departments where much of graduate education is administered [8]. They went further and called the universities to inform graduate students of various career options and offer a variety of curricular options so that they make more fulfilling career choices while more effectively fulfilling national goals.

The National Academies' reports concluded that the US doctoral programs prepare students with expertise in the area of their dissertation very well but miss out on providing non-technical skills that are particularly important to be successful in industry [4, 9]. Also, due to lack of exposure to industry and limiting their research to academic circles, the graduate students were generally unaware of the working environment in industry. Consequently, initial attempts on improving doctoral curricula such as the Accelerate-2-Industry (A2i) program initiated by

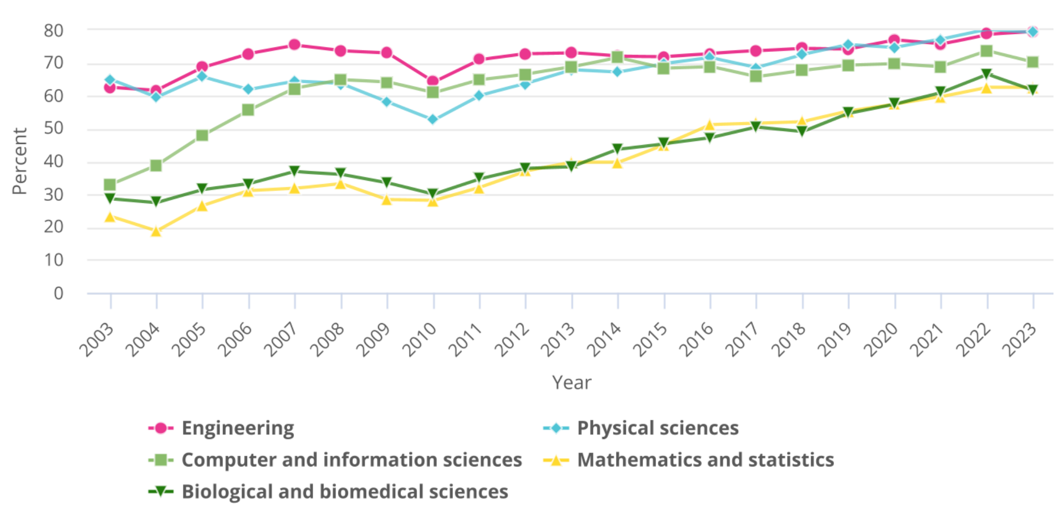

Fig. 1. Trend of various STEM PhDs to employment in industry or business during 2003-2023.

North Carolina State University and later adopted by many others, provided the students with short modules of lectures on career exploration, business communication, corporate culture, teamwork, project management, time management, leadership, market evaluation, regulatory affairs, etc. [10]. Also, the students were offered exposure to industry culture through an intensive industry immersion week, 10-40 hour long micro-internships or summer internships.

The feedback from students indicated that they made significant gains in communication, leadership, teamwork, project management, and adaptability [10]. The feedback from industry partners also supported these benefits concerning key professional knowledge, skills, and abilities important to the future workforce for industry.

A need for training doctoral workforce both for academia and non-academic jobs has been also recognized by funding agencies, especially the National Science Foundation, which started the NSF Research Traineeship (NRT) program ten years ago. This program specifically required explicit training of students in technical skills, communication skills, and other transferable professional skills (e.g., project management, leadership, ethics, teaching, entrepreneurship, teamwork, conflict resolution, and outreach) [11, 12]. The NRT program encouraged the home institution to train students in partnership with industry and other academic institutions. In 2024, NSF launched a new training opportunity, NRT Institutional Partnership Pilot (NRT-IPP) program, which explicitly required participation of industry [12]. This program called for primarily initiating new research-based MS programs in specified focus areas at relatively less research intensive (non-R1) institutions. Although not directly concerned with doctoral training, in due course this program should inform universities about the formation and effectiveness of industry-university partnerships to prepare students for positions in industry.

Unfortunately, despite the above-described efforts and funding programs, most of academia has been slow to respond and prepare the doctoral workforce to meet current needs [3, 13, 14, 15]. Therefore, around the time the A2i program was introduced, we independently developed a far more comprehensive model of doctoral training, called Pasteur Partnership PhD (P3) [3, 16]. It was designed to not only provide professional skills but also to develop the very mindset of the student to think about solving STEM challenges as one would do in industry. In this context, industry includes private corporations, national labs, defense organizations, regulatory agencies, healthcare institutions, etc., who employ PhDs. The P3 program calls for the training of PhDs in use-inspired research through active industry-university partnerships. The dissertation topic is identified collectively by the student, the industry partner and academic adviser. The model has four distinctive features superimposed on existing university requirements: 1. Pre-program summer internship; 2. Co-advising students by a university faculty member and an industry researcher; 3. Instructions for developing essential professional skills; and 4. Industry Residency (as in medical school). The student interest in pursuing PhD following P3 track has been overwhelming. For instance, in 2022 more than 95% of PhD applicants to STEM departments at Lehigh University expressed interest in joining this program. However, only 5% of applicants could be enrolled mostly due to the challenges in forming prerequisite industry-university partnerships [17].

As mechanisms to implement the P3 program are being tested, it is important to assess its effectiveness and impact on the training of students to become successful in their chosen career, whether in industry or academia. Previously, we reported an assessment of student demand and their experience with P3's non-traditional features, support of university administration, and the challenges felt by interested faculty advisers in implementing the P3 program at Lehigh University [3, 4]. In the present paper, we complete the model's assessment by soliciting feedback from industry scientists who have mentored P3 students.

Within the P3 model, there are three distinct opportunities for a student to learn how scientists in industry think, function and pursue their goals. We sought industry mentors' feedback on all three, depending on the length of their engagement with the mentee. The first opportunity, called pre-program internship, is meant to introduce to the students a broad perspective of the research problems under the supervision of industry experts, which they may investigate as part of doctoral dissertation together with relevant issues and challenges. This pre-program internship is meant to jump start dissertation work. Clearly, it is very different from typical summer internships offered by programs like A2i, which the students undertake to experience what it is like to work in industry irrespective of dissertation work.

The requirement of having an industry co-adviser throughout the duration of PhD is the second opportunity for the student to develop an industry mindset. Finally, in the third opportunity called 'Residency', the industry co-adviser would mentor the student at the industry partner location during the later years of the program. We hypothesized that this extensive mentoring of a P3 student by their industry adviser is a qualitatively superior approach for building industry mindset than any other formal approach currently in use at US institutions today. There are, however, programs in Germany, Scandinavia, UK, etc., sometimes called 'industry PhD', which engage industry scientists in the student's dissertation as in P3 program throughout the duration of doctoral program [18, 19]. They have guided the design of the P3 model.

This paper aims to complete a comprehensive evaluation of the P3 program by incorporating a crucial final component—insights from industry mentors. To achieve this, we sought to gather perspectives from industry professionals who have been deeply involved in the program, particularly those who have mentored and guided students' projects. Through in-depth interviews, we attempted to address a central research question: What are industry mentors' perspectives on the industry-university partnership in STEM graduate training? This inquiry demonstrates the role of industry mentorship in shaping students' professional and career development. It also helps assess the broader impact of industry-university collaborative programs of graduate training like the P3 program.

2. Method

We designed an interview protocol to engage industry mentors, and analyzed their responses as described next.

2.1. Design of the Interview Protocol

The interview protocol for industry mentors participating in the P3 program was designed to capture their experiences and insights through three primary themes: *Student-Mentor Engagement and Practices*, *Student Development*, and *Overall Program Impact and Feedback* (see Appendix for detailed questions). These themes provide a structured framework to explore the mentors' involvement in the program, their observations of student growth, and their perspectives on the program's effectiveness.

The first theme, *Student-mentor Engagement and Practices*, focuses on understanding how industry mentors became involved in the P3 program, the duration of their participation, and their specific mentoring approaches. Questions such as "How did you get involved with the P3 program initially?" and "Can you provide an example of how you mentored P3 students during their pre-program internship or residency?" delve into the operational and interpersonal dynamics of mentorship patterns. This theme provides critical insights into how mentors support students during their residency and back at university, shedding light on the mechanisms that drive successful mentorship within the program.

The second theme addresses student development, aiming to evaluate the transformative impact of the program on participating PhD candidates. Questions in this section ask mentors to reflect on changes in students' professional, intellectual, and psychological skills, including areas like collaboration, critical thinking, and self-efficacy. An example question is "Did you perceive any changes in the student's professional skills?" By focusing on specific skillsets and psychological perspectives, the protocol highlights the program's contribution to students' growth and professional readiness, as observed by their mentors.

The final theme examines the broader impact of the P3 program and gathers feedback for its future improvement. Mentors are asked to provide their perspectives on the program's benefits compared to other research initiatives, the value it brings to their organizations, and any challenges or drawbacks they have encountered. Questions such as "What is your feedback on the P3 program?" and "Are there any suggestions you would like to make regarding the future development of similar collaborative training programs?" encourage mentors to share constructive feedback. This information ensures that their insights are incorporated into the program's refinement and potential replication in other settings.

Overall, this interview protocol is designed to generate a holistic understanding of the P3 program's multifaceted impact from industry mentors' perspective. By exploring mentorship practices, student outcomes, and program efficacy, the protocol generates actionable insights to enhance future similar workforce training initiatives that build on industry-academia collaboration.

2.2. Interview Process and Analysis

A total of six industry mentors were invited to participate in the interviews. They all have been involved in the P3 program and mentoring multiple doctoral students for one to nine years. These mentors represented a diverse range of institutions and entities, including companies like Corning and Michelin, and national laboratories such as Oak Ridge National Laboratory and Brookhaven National Laboratory. Each interview was conducted via phone call or on Zoom. Industry mentors provided informed consent prior to the commencement of the interviews, ensuring ethical compliance and respect for their participation. With their permission, the interviews were audio-recorded to accurately capture their responses. The recorded interviews were subsequently transcribed for further qualitative analysis.

An open coding process was employed to analyze the interview transcripts. We systematically examined all transcripts and extracted general themes aligned with the three thematic areas of the interview protocol: student-mentor engagement and practices, student development, and overall program impact and feedback. Under each theme, specific subthemes were generated to further explore the findings and organize the data within each thematic category. When data aligned with the scope of multiple subthemes, it was double coded to ensure comprehensive coverage. Throughout the coding and recoding process, the themes were verified, organized, and iteratively refined using constant comparative methods to maintain analytical rigor and consistency [20], which allowed for the continuous refinement of themes and ensured that the coding process accurately represented the mentors' insights and experiences. Table 1 summarizes the codebook for analyzing interview outcomes.

Table 1: Codebook of Interview Data

Theme	Subtheme	Definition	Quote

Student-mentor Engagement and Practices	*During the Pre-program Internship or Residency*	Activities, practices, and interactions mentors engage in with students during their P3 pre-program internship or residency period.	A kind of together journey on understanding the topic, on figuring out the questions that need to be solved.
	After the Pre-program Internship or Residency	Mentoring practices, follow-ups, and interactions that occur once the students return to their academic institutions.	We (mentor and the mentee) are planning these meetings with his faculty advisor of Lehigh University to share data and results that he has obtained here.
Students' Development	*Professional Skills*	Development in students' technical and intellectual skills enhances their professional competency.	I've seen over time here that he's become a much better programmer, and a lot of that has come down to his project.
	Essential Professional Skills	Growth in students' interpersonal skills, such as communication, collaboration, and problem-solving abilities.	Main growth is critical thinking skills.
Program Impacts and Feedback	*Impact on Partner*	The perceived benefits and contributions of the P3 program to the mentors' organizations.	Having this sort of interaction, I think, is very helpful for all scientists, because sometimes we forget that when we are talking with scientists from other backgrounds.
	Elements to Maintain	Features or elements of the P3 program that mentors identify as particularly successful or effective and should remain unchanged in future iterations of the program.	I believe that one of the key elements is supporting this kind of student mobility between the two entities.
	Points for Optimization	Components of the P3 program that mentors perceive as areas needing enhancement or revision to increase the program's efficacy or address any identified challenges.	Probably getting involved earlier in the process would have been good.

3. Results

We analyzed the interview transcripts and identified key outcomes from discussions with industry mentors about the three overarching themes: *Student-Mentor Engagement and Practice*, *Student Development*, and *Program Impacts and Feedback*. The results are described in detail in the following subsections.

3.1. *Student-mentor Engagement and Practices*

The theme *Student-mentor Engagement and Practices* examines how mentors guided doctoral students during their pre-program internships, advising and/or residencies and supporting them after they returned to academia. The subtheme *During the Pre-program Internship or Residency* reflects mentors' efforts to provide students with hands-on learning experiences that bridged the gap between academia and industry. One mentor explained, "Because I think part of what the student wants is to see how to apply their research in a real-world environment, so we worked closely to ensure that." This quote underscores the intentionality of mentoring efforts to contextualize academic research within practical, industry-relevant settings. By working "closely," mentors offered opportunities for students to understand the nuances of industrial processes, including the constraints and expectations that shape real-world problem-solving. Another mentor described the experience as "a kind of together journey on understanding the project's scope and direction." This collaborative framing suggests that the industry mentor and doctoral student operated as co-learners, navigating complex projects together to foster mutual understanding and growth. This dynamic partnership highlights a unique aspect of the P3 mentorship model, where learning and problem-solving are iterative, shared endeavors rather than hierarchical processes, at least during the early stages of mentoring.

The subtheme *After the Pre-program Internship or Residency* captures mentors' continued involvement in supporting doctoral students' professional growth after the structured pre-program internship or residency period. One mentor shared, "I keep in touch to help them think about how their industry experience could inform their dissertation or future research." There was a deliberate effort to extend the value of the pre-program internship beyond its immediate context by encouraging students to integrate industry-relevant insights into their academic work. Another mentor noted, "The follow-ups were critical because they ensured that the student could contextualize their industrial learnings into academic projects." Thus, industry mentors not only provided guidance but also acted as bridges between the academic and industrial domains, enabling doctoral students to translate their academic skills into practical and real-world research projects. These extended relationships highlight the importance of sustaining mentorship ties to reinforce the program's long-term impact on students' professional trajectories.

3.2. *Student Development*

The theme *Student Development* captures the transformative impact of the industry mentorship mechanism from the P3 program on doctoral students, focusing on both professional skills and essential professional skills. Under the subtheme Professional Skills, industry mentors observed significant growth in doctoral students' professional capabilities and their ability to address industry challenges. One mentor remarked, "I've seen over time that he's become much more adept at translating theoretical concepts into practical solutions. His ability to propose actionable strategies improved tremendously." This insight demonstrates the program's success in helping students bridge the gap between abstract theories and the tangible demands of industrial work. Another mentor added, "The exposure to real-world constraints, such as budgets and timelines, added a layer of realism to their problem-solving skills that academia sometimes lacks." This comment emphasizes the importance of contextual factors in shaping doctoral students' problem-solving approaches, suggesting that the program complements academic training by exposing students to practical limitations that are often absent in purely academic exercises.

The subtheme *Essential Professional Skills* reflects the program's impact on doctoral students' interpersonal and collaborative abilities. One mentor explained, "At the start, she was hesitant to speak up in meetings, but by the end, she was confidently presenting her ideas to senior leaders." This quote highlights the transformation in students' confidence and communication skills, critical attributes for navigating professional environments. Another mentor noted, "The ability to work collaboratively in cross-disciplinary teams was one of the biggest changes I saw. They learned how to navigate differing perspectives and find common ground." Evidently, the program's emphasis on teamwork and interdisciplinary collaboration provided students with invaluable opportunities to develop skills that are essential for success in collaborative, multi-stakeholder research projects. Furthermore, another mentor remarked, "He learned to handle uncertainty better, which is a critical skill when working on cutting-edge research." This observation underscores the industry mentors' essential role in preparing students for the ambiguity inherent in innovative work, fostering resilience and adaptability.

3.3. *Program Impacts and Feedback*

The theme *Program Impacts and Feedback* explores the broader implications of the P3 program from industry mentors' perspective, including its impact on host organizations, strengths to retain, and areas for improvement. Under the subtheme *Impact on Partner*, industry mentors highlighted the tangible benefits students brought to their organizations. One mentor shared, "The student's work led to a prototype we're now testing for larger-scale deployment." This quote illustrates the immediate applicability of students' contributions, showcasing how doctoral students in the P3 program could create value for industry partners. Another mentor stated, "Her fresh perspective and novel approaches helped us solve a problem we had been stuck on for months." This suggests that the program not only provides doctoral students with learning opportunities but also allows mentors to benefit from innovative ideas and approaches informed by academic research.

Under the subtheme *Elements to Maintain*, mentors identified strengths of the program that should remain unchanged. One mentor remarked, "The structured nature of the program, with clear goals and timelines, is critical to its success. It should stay as it is." This comment highlights the importance of the program's design in creating a well-defined framework for collaboration. Another emphasized, "The focus on hands-on learning is what sets this program apart. That's something that shouldn't change." This feedback underscores the value of applied learning experiences in preparing students for industry roles and suggests that such elements are central to the program's success.

The subtheme *Points for Optimization* reflects areas where mentors saw opportunities for refinement. One mentor suggested, "The academic calendar doesn't always align well with the industry project timelines, which creates some challenges." This observation indicates a need for better synchronization between academic and industry schedules to enhance the program's operational efficiency. Another mentor pointed out, "More support during the transition back to academia would help students integrate their learnings more effectively." This feedback suggests that providing additional resources or structured follow-up sessions could help students maximize the long-term benefits of their industry experiences.

Additionally, mentors also offered forward-looking insights into the program's potential evolution. One mentor proposed, "Expanding the program to include postdoctoral fellows could broaden its impact and attract more industry interest." This recommendation highlights the scalability of the program and its potential to address a wider audience. Another mentor envisioned, "This program could serve as a model for global collaboration between academia and industry, especially in emerging fields like AI and clean energy." This forward-thinking perspective emphasizes the program's relevance to addressing global challenges and its potential to shape future research and innovation ecosystems.

4. Discussion and Implications of Results

The findings from this study provide valuable insights into the design and implementation of collaborative programs like the P3 initiative, where doctoral students engage in industry-based pre-program internships and residencies under the mentorship of industry co-advisers. These insights highlight key elements of effective mentorship, the transformative impact on student development, and the broader organizational benefits of such programs. Future iterations of similar programs can leverage these results to enhance their design and maximize their impact.

One of the key takeaways from this study is the importance of structured and collaborative mentorship. During the Residency phase, mentors emphasized the need for close collaboration and hands-on learning opportunities, enabling students to contextualize their academic knowledge within real-world applications. This mentorship style, described as a "together journey," not only enhanced students' technical skills but also fostered mutual learning between mentors and mentees. Programs aiming to replicate this success should prioritize clear guidelines for mentorship while allowing flexibility for mentors to adapt their styles to individual students' needs. Additionally, continued engagement after the pre-program internship was critical in sustaining the program's impact. Providing resources and frameworks to facilitate post-internship or residency interactions, such as structured follow-ups or mentoring workshops, could amplify the long-term benefits for students and mentors alike.

A significant implication of these findings is the dual emphasis on professional and soft skills development. Mentors observed that students became more adept at translating theoretical concepts into practical solutions and navigating real-world constraints like budgets and timelines. These skills are essential for transitioning from academia to industry. Moreover, the courses provided by the program on teamwork and communication helped students sharpen their interpersonal skills, which are often pivotal in interdisciplinary and collaborative environments. Future programs should integrate explicit training and feedback mechanisms to further enhance these competencies. For example, incorporating opportunities for students to lead team meetings or present their findings to diverse audiences could build confidence and prepare them for leadership roles.

It is important to note that industry co-advisers also emphasized the importance of aligning mentorship efforts with the students' dissertation to ensure meaningful engagement and learning. They noted that after the mentee left for Lehigh, his focus was entirely on writing and defending his dissertation, which was central to his academic progress. This alignment of mentorship with the student's specific academic goals, rather than diverting attention to unrelated or arbitrary topics, was critical in keeping the mentee fully engaged and deriving maximum benefit from the program. This finding indicates that future programs should prioritize project relevance and create structures that directly support students' primary research areas, ensuring their work is both meaningful and impactful. Additionally, fostering an environment that integrates mentorship with practical, thesis or dissertation-related challenges can maximize engagement and reinforce learning outcomes.

The program's impact extended beyond individual participants to the host organizations, with mentors reporting tangible contributions such as prototypes and novel solutions to longstanding problems. This observation suggests that such programs can be mutually beneficial, offering value to industry partners while providing rich learning experiences for students. To build on this benefit, future programs should establish mechanisms to clearly align academic and industry objectives, such as co-defining project goals at the outset or scheduling regular check-ins to ensure alignment. Additionally, organizations could benefit from frameworks that encourage mentors to reflect on their own professional growth through their participation, creating a culture of reciprocal learning.

Despite its strengths, the program revealed areas for improvement that future initiatives can address and incorporate. Misalignment between academic calendars and industry project timelines was identified as a logistical challenge. Collaborative programs should aim to better synchronize schedules or provide flexibility to accommodate varying timelines. Furthermore, enhancing support during students' transition back to academia, such as structured debriefing sessions or integration workshops, could help students synthesize their industrial learning more effectively. Programs could also expand their target audience to include postdoctoral fellows or early-career researchers, as suggested by mentors, to broaden their reach and impact.

The results also highlight the scalability and potential of these programs to address emerging global challenges. Expanding collaborative programs into fields such as application of artificial intelligence in engineering, clean energy, and sustainable technologies could strengthen academia-industry partnerships in addressing pressing societal needs. By incorporating these thematic areas and aligning with global research priorities, similar programs could serve as benchmarks for fostering innovation and preparing future leaders in science and technology.

5. Conclusions

A new model of STEM doctorate, Pasteur Partners PhD (P3) was proposed in 2019 to prepare the doctoral workforce for careers outside academia where the vast majority of them will work. This study examined the experiences of six industry mentors who served as co-advisers to STEM doctoral students enrolled in the P3 program. The analysis of their experiences generated three key themes: Student-Mentor Engagement and Practices, Student Development, and Program Impacts and Feedback. The findings highlight the critical role of structured mentorship in bridging the gap between academia and industry by providing students with hands-on experience and sustained professional guidance. Students demonstrated significant growth in both technical competencies and essential professional skills, such as problem-solving, interdisciplinary collaboration, and communication. Industry mentors and their organizations also derived benefits, including novel insights and tangible contributions to their research and development projects. There was a suggestion to expand the program to include mentoring of postdoctoral researchers and strengthen industry-university partnership. Thus, the present study provides valuable insight into the mutual benefits of industry-university partnership beyond the mentorship of P3 students.

While the program's structured framework and emphasis on applied learning were well-received, challenges such as academic-industry timeline alignment and the need for stronger post-internship integration support were identified. Addressing these challenges and expanding the P3 model to also include postdoctoral researchers and emerging fields would further strengthen its impact and sustainability, reinforcing its value as a model for fostering productive academia-industry partnerships.

Finally, the knowledge gained through present study is not limited to the P3 model. It should be broadly useful also for developing the STEM workforce through industry-university partnerships.

6. Acknowledgements

The authors thank Nathan Urban and Gary Calabrese for helpful discussions that led to the survey presented here. This work is supported by the Innovation in Graduate Education program of Division of Graduate Education, National Science Foundation (DGE-1806904).

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Appendix

P3 Industry Mentors Interview Protocol

1. How did you get involved with the P3 program initially?

    1.1. How long have you been participating in the P3 program?

    1.2. How many students have you mentored for the program?

2. Can you provide an example of how you mentored P3 students during their pre-program internship or residency?

3. Can you describe your mentorship pattern while P3 students are back at university? (e.g., frequencies of the meetings, type of research inquiries students had, etc.?)

4. As a result of the mentoring students involved in the P3 program, did you perceive any changes in their professional skills?

    4.1. Changes in intellectual skills?

    4.2. Changes in soft skills (collaboration, critical thinking, problem-solving, etc.)?

5. What was your perspective on collaborative programs like P3 before you got involved? After mentoring P3 students and being part of the program, has your perspective changed?

6. You probably collaborated with many universities on joint research programs. Did you find any benefits of interactions through the P3 program that focused on students vs. other programs that focused primarily on research rather than the student training? Any drawbacks?

7. Did you benefit personally from participating in the P3 program? How?

    7.1. In your opinion, how did your company (viz. Corning) benefit from participating in the P3 program? Could this program be emulated by other companies?

8. In general, what is your feedback on the P3 program?

    8.1. Feedback on pre-program internship.

    8.2. Feedback on residency.

    8.3. Feedback on co-advising.

9. Are there any suggestions you would like to make regarding the future development of similar collaborative programs?