Assessing a Seminar Series Designed to Help Prepare Doctoral Engineering Graduates for the Academic Job Market

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Assessing a seminar series designed to help prepare doctoral engineering graduates for the academic job market

Abstract

The goal of this project was to obtain an assessment of the effectiveness of a seminar series developed to assist Ph.D. students and postdoctoral scholars with applying and interviewing for academic positions. The seminar series, Seminar on Entering Academia (SEA), was offered within the College of Engineering at the Pennsylvania State University to provide students with an opportunity for professional development to assist in their pursuit of faculty positions. Anecdotally, many Ph.D. students at this institution begin their careers with academia in mind. However, while the individual graduate programs in the college provide students with excellent technical training, Ph.D. students and postdocs receive little to no formal training on how to prepare for an academic position or how to approach the academic job market. This lack of preparation decreases the likelihood that graduates will obtain these competitive positions.

Providing more focused preparation can also reduce barriers to entering academia, increasing both the number and diversity of qualified candidates.
To provide students with such preparation, a seminar series was offered in Spring 2022 and Spring 2023 and was organized and co-taught by two or three faculty members as a service activity and not part of their teaching load. SEA consisted of three topic areas: (1) information about academic careers and pathways, (2) application process and materials, and (3) interview process and expectations. For the first two topic areas, most of the seminars were led by the co-instructors, while for the final topic area of the series, most of the seminars were led by invited speakers who serve in leadership roles within the college.

The seminar was piloted with a select group in Spring 2022 and offered more broadly in Spring 2023. To assess the impact of the seminar series, both qualitative and quantitative data were collected. For the former, a handful of participants were interviewed using a semi-structured format. For the quantitative data collection, pre- and post-seminar surveys were conducted for both offerings. The survey results showed a statistically significant increase in perceived preparedness to apply and interview for academic positions. The data also showed an increase in the likelihood that attendees would apply for academic positions. The interviews highlighted the positive aspects of the seminar, including insights into the application process, guidance on crafting application materials, and opportunities for peer review. Suggestions for improvement included incorporating follow-up sessions, accountability groups, and more emphasis on networking and relationship-building. Overall, the participants found value in the seminar, and their feedback reinforces the importance of providing comprehensive training and fostering a supportive community in the academic job preparation process.

1. Introduction

Professional development of graduate engineering students is highly beneficial to students, academia, and industry (1). In their study of psychology graduate students, Ducheny et al. (1997) recommend that it's important for graduate faculty to establish a foundation for lifelong professional development and to address current students' needs as they progress through their program (2). O'Meara et al. (2014) emphasize the need for STEM graduate programs to establish clear strategies to positively influence graduate student agency for career advancement (3). In light of these needs, a seminar series on the application and hiring process for academic positions was developed within the College of Engineering for upper-level Ph.D. students and postdoctoral scholars at the Pennsylvania State University. The Seminar on Entering Academia (SEA) is currently in its third offering and attracts about 20-30 students to each weekly seminar.

2. Overview of the seminar series: Seminar on Entering Academia (SEA)

The seminar series was first offered in spring 2022 as a 1-credit course to upper-level Ph.D. students (defined as those who passed their Ph.D. comprehensive exam) in the departments of Civil and Environmental Engineering and Nuclear Engineering. The course took place weekly and was scheduled for a 75-minute period. Approximately 20 students were formally enrolled, but there was broad interest from students in other engineering departments and postdoctoral scholars as well; regular attendance was approximately 30 students. To broaden participation in the following and current years, Spring 2023 and Spring 2024, respectively, the content is now offered as a completely optional seminar series, rather than a course, and is open to all College of Engineering Ph.D. students and postdoctoral scholars at Penn State, and as space allows students and postdocs from across the university. The series is organized and co-taught by two or three faculty members as a service activity outside of formal teaching loads.

In its current form, 75-minute seminars take place weekly over 13 weeks during the spring semester. The series is divided into three parts as indicated in Table 1. The introductory part focuses on the types of faculty positions and the pathways to such positions. The emphasis of the second and most comprehensive part is the required application materials and includes the optional preparation and peer-review of materials. Lastly, the series wraps up with several sessions on the interview process and ends with a session on how to negotiate an offer.

Table 1. Seminar on Entering Academia Weekly Schedule (75-minute periods)

	Wk	Topic	Format
Part 1: Do I want to be a faculty member? Types of Faculty Positions & Pathways	1	Duties of a Tenure Track (Pre-tenure)e Faculty	Lecture – Course Instructors
	2	Professional Track (non-tenure line) Faculty Positions	Panel Discussion – 3 Professional Track Faculty Members
	3	Paths to Faculty Positions	Lecture – Course Instructors
Part 2: How do I apply for faculty positions? Academic Hiring Process and Preparing Application Materials	4	Academic Hiring Process; Finding an Academic Position; How to Read Job Postings	Lecture – Course Instructors
	5	Preparing Application Materials 1: CV & Cover Letter	Lecture – Course Instructors
	6	Preparing Application Materials 2: Research Statement	Lecture – Course Instructors
	7	Preparing Application Materials 3: Teaching Statement	Lecture – Course Instructors
	8	Peer Review of Draft Application Materials	Small group discussion
	9	Preparing Application Materials 4: DEIB Statement	Guest Instructor, DEIB Program Director
Part 3: What is the interview and hiring process?	10	Phone/Video Interview	Lecture – Course Instructors
	11	On-campus Interview	Guest Instructor, Department Head
	12	Research Seminar for On-campus Interview	Guest Instructor, Department Head
	13	Negotiating an Offer	Guest Instructor, Department Head

3. Assessing students' preparedness for applying for, interviewing for, and succeeding in an academic position

3.1 Research questions and survey instrument

To gain a better understanding of the seminar participants' relative preparedness for applying, interviewing, and holding a tenure-track position, a survey instrument was developed. The specific research questions are:

1. Does the Seminar on Entering Academia increase students' feelings of preparedness to **apply** for an academic position at the start and end of the seminar series?
2. Does the Seminar on Entering Academia increase students' feelings of preparedness to **interview** for an academic position at the start and end of the seminar series?

The survey was administered at the start and end of the seminar series in Spring 2022 (when offered as a course) and in Spring 2023. The survey consisted of a combination of free response

and rating questions, where the rating questions were related to feelings of preparedness for several items on a scale where 1 = “I have absolutely no idea what I am doing” to 5 = “I know exactly what to do.”

The survey questions related to *preparedness to apply for positions* were, “How good to you feel about…”:

- Writing a cover letter for an academic position?
- Writing a research statement?
- Writing a teaching statement?
- Writing a diversity, equity, and inclusion statement?

The survey questions related to *preparedness to interview for positions* were, “How good to you feel about…”:

- Doing a phone interview?
- Doing an on-campus interview (in general)?
- Giving a research seminar during an on-campus interview?
- Chatting during meetings/meals during an on-campus interview?
- Negotiating an offer letter (including start-up package, salary, etc.)?

Lastly, the survey also included questions related to *preparedness to succeed in an academic position* since the following topics were briefly touched upon in the seminar series. The questions were, “How ready do you feel to…”:

- Start/lead a research group?
- Create a research agenda?
- Apply for projects/grants/research funding?

Informal qualitative interviews were also conducted with a randomly selected group of students who took the series as a course in Spring 2022 by an external facilitator (i.e., not one of the instructors) following the conclusion of the seminar series.

3.2 Survey participants

Table 2 provides a summary of the number of responses received to each of the pre- and post-seminar surveys by semester offered. The number of respondents at the start and end of the seminar were more consistent in Spring 2022 than in Spring 2023 since it was offered as a class that term and not as an optional seminar series as it was in Spring 2023.

Table 2. Number of survey responses received by survey type and semester.

	Pre-Seminar	Post-Seminar
Spring 2022	21	17
Spring 2023	36	16

4. Survey results and qualitative interview summaries

4.1 Quantitative survey results

The pre-seminar surveys revealed that approximately 26% of participants had already applied for an academic position, but only 29.6% indicated that they felt adequately prepared to apply for an academic position at this point in their careers.

Fig. 1 provides a summary of the survey responses received related to questions on students' feelings of preparedness to **apply** for an academic position. The mean ratings across the four items increased from approximately 2.5/5 to over 4/5 pre- and post-seminar. The differences pre- and post-seminar for each question were evaluated using a t-test and all were found to be statistically different for $p < 0.05$. In addition, the range of responses decreased in the post-seminar survey indicating students had more homogeneous sense of feeling ready to apply.

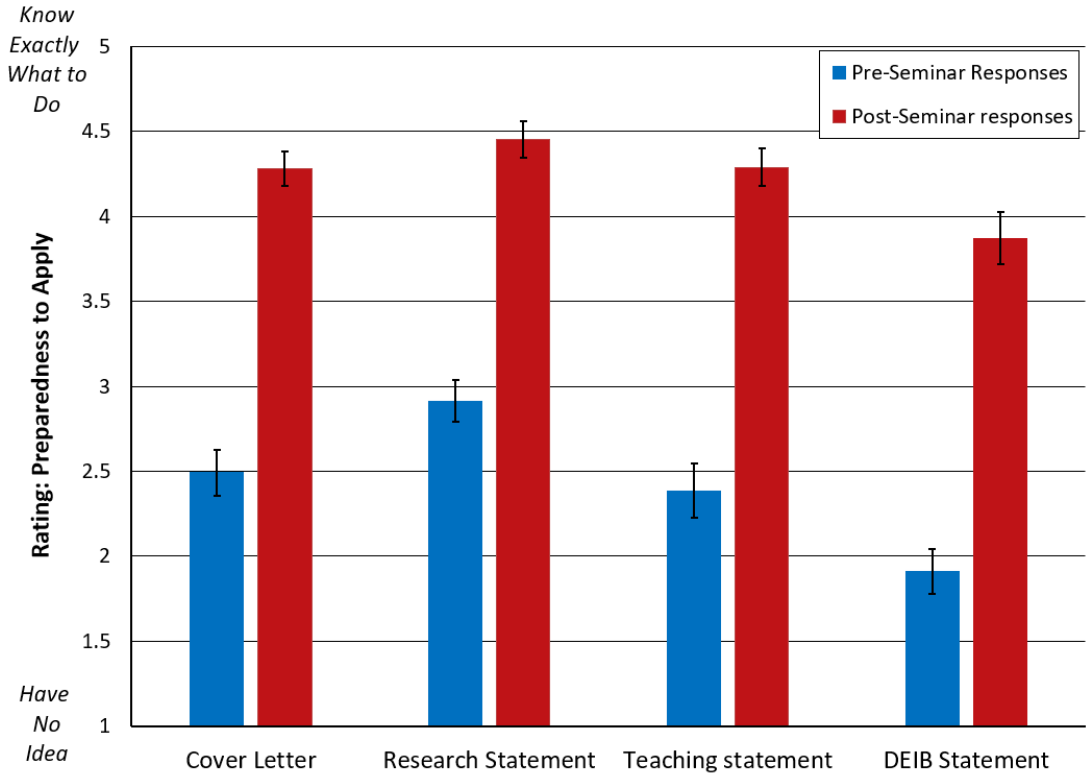

Figure 1. Survey responses related to preparedness to apply for an academic position. The error bars represent the standard error.

In terms of the students' feelings of preparedness to **interview** for an academic position, respondents indicated they felt they had a much better idea of how to proceed than before the seminar as shown in Fig. 2 and these differences are statistically different ($p < 0.05$). The increase in ratings was not as much as for preparedness to apply, which is not surprising given students didn't complete any outside work on these items.

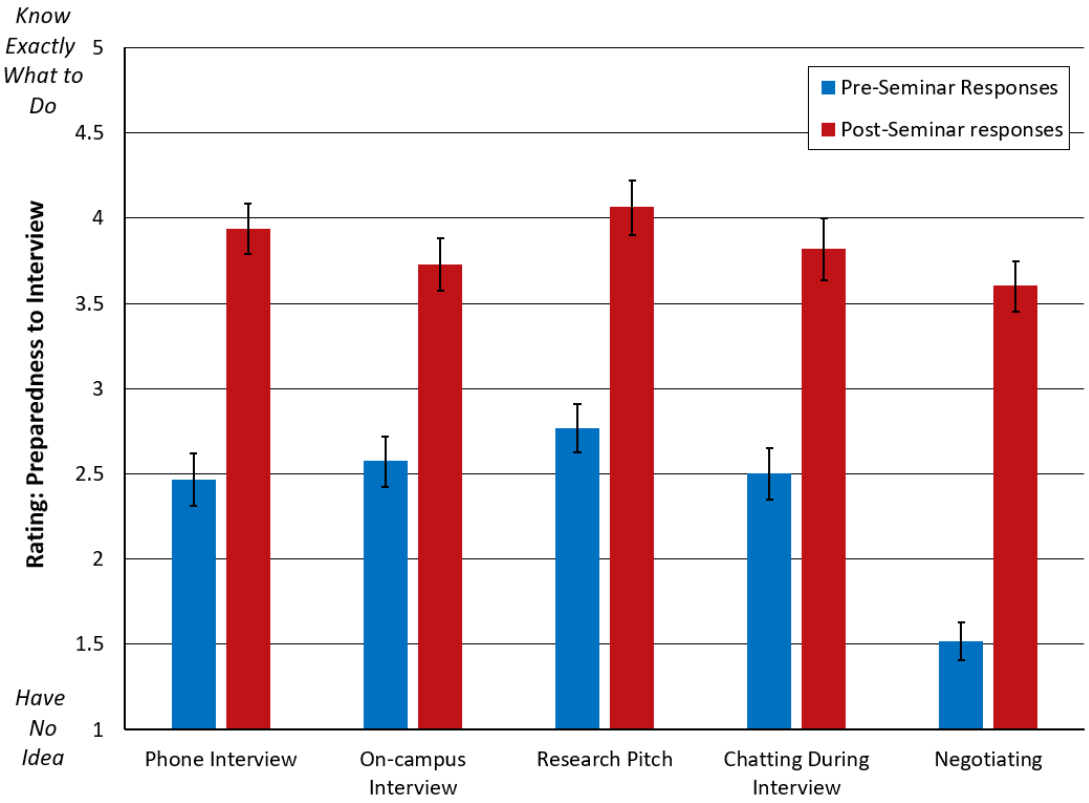

Figure 2. Survey responses related to preparedness to interview for an academic position. The error bars represent the standard error.

Lastly, Fig. 3 provides a summary of the survey responses received related to questions on degree to which participants feel prepared to **succeed** in an academic position. As with the other two categories of preparedness, the ratings significantly increased post-seminar ($p < 0.05$), but to a much lesser degree. However, given these topics weren't main seminar topics and were only briefly touched on, , no strong conclusions can be drawn from the results. To help prepare students to succeed in academia, more formal programming on this topic would be needed, such as dedicated workshops on the skills necessary to lead a research program and/or a shadowing program of pre-tenure faculty at teaching-focused or research-focused institutions.

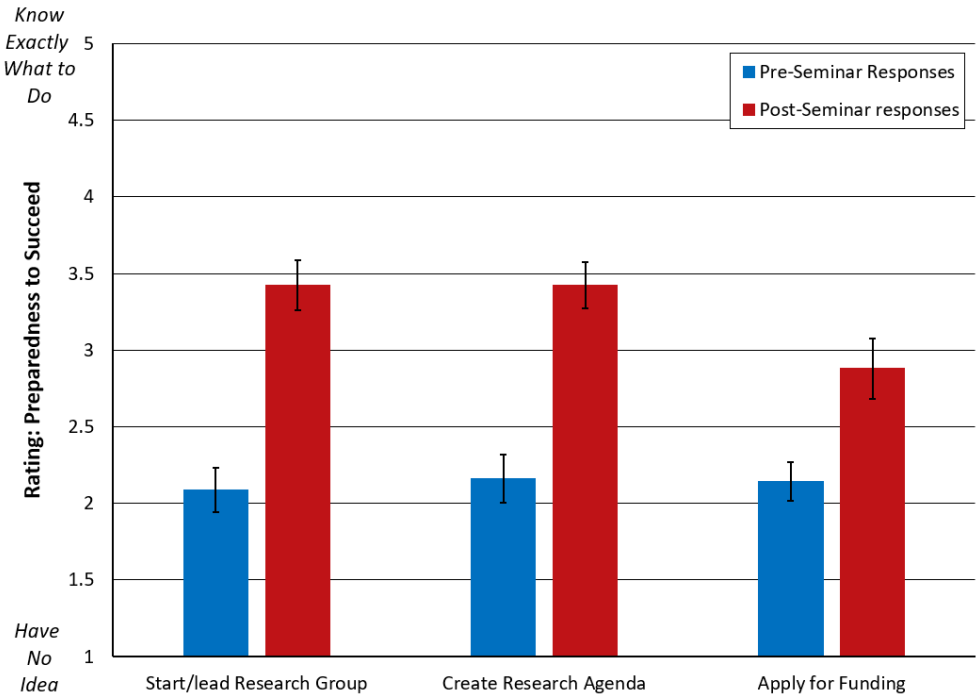

Figure 3. Survey responses related to preparedness to succeed at an academic position. The error bars represent the standard error.

Overall, the results were extremely positive. The seminar series showed statistically significant gains (at the 95% confidence level using t-tests) in all measures of preparedness to apply for, interview for, and succeed at an academic position. Respondents also indicated that the seminar also increased the likelihood of applying to an academic job from 75.4% in the pre-survey to 81.8% in the post-survey. The modest gains here are likely due to the high interest in academic jobs of students attending the seminar series.

4.2 Qualitative survey insights

To gain further insight, three students from the first cohort (Spring 2022) were randomly selected and asked to share their insights and experiences in a semi-structured qualitative interview conducted by an external evaluator. The identity of these students was kept confidential from the course instructors. A summary of the interviews with each participant is provided below.

Participant 1 (P1): P1, a fifth-year architectural engineering graduate student, initially intended to pursue a master's degree and enter industry but decided to stay for a Ph.D. due to his passion for research. He learned about the seminar through his wife and enrolled to gain valuable knowledge and feedback without dedicating excessive time. P1's expectations included learning about the interview process, preparing application materials, and exploring non-academic opportunities. The seminar broadened his understanding of career options, provided insights into crafting application documents, and facilitated peer review. He believes the seminar surpassed

his expectations to some extent, although he suggests incorporating follow-up sessions and accountability groups for continued support in research statement development, and interview preparation.

Participant 2 (P2): P2, a recent Ph.D. graduate in civil environmental engineering at the time of the interview, discovered the seminar through her department's mailing list. She decided to attend based on the seminar's relevance to her academic job search and after receiving approval from her advisor. Her expectations from the seminar included preparing research, teaching and DEIB statements, learning about various academic positions, gaining feedback on application materials, and understanding the negotiation processes. P2 found the seminar helpful in evaluating academic paths aligned with her goals and received valuable feedback on application materials. She plans to pursue a postdoc before seeking an academic position and believes the seminar adequately prepared her in many aspects, although the importance of building professional networks and personal relationships could have been emphasized further.

Participant 3 (P3): P3, a fourth-year Ph.D. student in Civil and Environmental Engineering, learned about the seminar through an email from his department. He enrolled because he desired systematic training in academic job applications, which was lacking in available online resources. P3 appreciated the seminar's systematic training and the fact that it counted as one credit. He emphasized the importance of community building and suggested making the seminar a continued official offering to benefit other students. P3's expectations included understanding the overall application process, receiving guidance on application drafting, and building connections with colleagues and professors. He highlighted the complexity of negotiation and the interview process and believed that community support would be valuable during challenging times.

The interviews with P1, P2, and P3 highlighted the positive aspects of the seminar, including insights into the application process, guidance on crafting application materials, and opportunities for peer review. Suggestions for improvement included incorporating follow-up sessions, accountability groups, and more emphasis on networking and relationship-building. Overall, the participants found value in the seminar, and their feedback reinforces the importance of providing comprehensive training and fostering a supportive community in the academic job preparation process. Future data analysis of the responses to the open-ended survey questions will be helpful to supplement these findings.

Lastly, student comments to the Spring 2022 semester (when offered as a 1-credit course) suggested that students were generally positive and that the course filled a critical need in their graduate education. Examples include:

- “This course was on an important topic which was absent during the previous years. The professor's knowledge, patience, and willingness to answer our questions and concerns were so helpful.”
- “Literally seeing this information at any point in time is amazing. Practice writing some of the statements was very good as well.”
- “The written assignments along with the feedback from peers and teachers helped quite a lot. It was especially helpful to get feedback from the instructors as they have more of a sense as to what the application materials should contain. Guest lecturers were also helpful because they provided different perspectives from which we could learn.”
- “Discussions, assignments targeted towards real-application material. Broadened understanding of job roles, responsibilities and how to apply as a graduate student to these jobs. Examples of application materials shared…helped to draft our own materials.”

5. Future plans

Based on the positive feedback and strong interest from participants, the intent is to continue to offer the seminar series annually. The current structure with 2-3 co-instructors allows for flexibility for faculty to roll off and on to reduce the service load for individual faculty. The benefits of this strategy has already been evidenced multiple times during this short duration. For example, one of the two co-instructors from the Spring 2022 semester left for another position in Fall 2022. For the Spring 2024 offering, one of the three co-instructors from Spring 2023 was on maternity leave. The use of a “team” teaching approach has allowed the seminar series to absorb such events without any meaningful loss in content or disruption to the seminar offerings.

Future plans are to continue to teach the seminar series with this co-instructor format moving forward. The current team will identify and engage a group of core faculty (approximately 4-6) across various engineering departments at Penn State that are willing to co-teach this course in the future. These core faculty members would initially serve as guest lecturers and/or help prepare materials, before rotating course delivery among the group. New members will be added as existing members “rotate off” at regular intervals. This approach will help keep the content fresh and avoid overburdening individual faculty members over time.

In terms of possible future research, more formal survey and interview instruments could be developed using an appropriate professional development evaluation framework (4). A mixed-methods approach would allow for a better understanding of students’ needs coming into the seminar series and how effectively the series meets those needs. An additional survey following the seminar series 6-12 months later would also provide more insights into the effectiveness of the series after participants have applied for and possibly received offers for academic positions.

As the course expands, it may also be marketed more to students who are hesitant to enter the academic profession due to concerns about preparation or lack of clarity on the process (as opposed to those that are more "decided" about this path). As various delivery methods for the course structure are explored, options to increase utility for students who are not committed to an academic career will be factored into the decision.

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