

Supporting early career faculty professional development through meaningful engagement and collaboration

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Evidence-based Practice Paper: Supporting early career faculty professional development through meaningful engagement and collaboration

Recent data indicate that only approximately 12-13% of engineering PhD graduates in the United States secure tenure-track faculty positions, with an even smaller subset ultimately achieving tenure (Stapleton, 2024). Upon entering academic roles, engineering faculty encounter stringent requirements for promotion and tenure, with success frequently contingent on their ability to consistently and successfully submit and secure competitive grant proposals and secure funding to sustain their research long-term.

In response to this challenge, the Natural Hazards Engineering Research Infrastructure (NHERI), supported by the National Science Foundation, developed a Summer Institute targeting early-career engineering faculty. Grounded in established educational practices, the program incorporated structured workshop lesson plans and employed formative evaluation processes to iteratively refine the program's activities each year. Over nine years, the NHERI Summer Institute convened junior faculty from a range of disciplines, all engaged in advancing natural hazards mitigation, to participate in comprehensive, intense training on grant proposal development and collaborative, interdisciplinary research.

This evidence-based practice paper describes the design and evaluations of the Summer Institute and reports longitudinal outcomes for early-career faculty who participated in the program.

Background

Engineering faculty often require targeted career and professional development as they transition into academic goals, yet engaging, hands-on, active learning opportunities tailored to their needs remain limited and inconsistently available. When training is offered, it often lacks structured active learning components that would model evidence-based instructional practices.

Typical promotion and tenure criteria for engineering faculty emphasize sustained research productivity, including peer-reviewed publications, competitive grant submissions, and funded awards, patents, conference presentations, and graduate student supervision. In many institutions, quantitative models with multi-criteria scoring systems are used to evaluate engineering faculty performance for annual review, and these metrics subsequently inform promotion and tenure decisions (Han, Wan, & Wang, 2020).

Given these expectations, there is a clear need for empirically grounded, long-term professional development initiatives that support early-career engineering faculty and connect them with disciplinary and interdisciplinary research resources and networks. Such efforts can provide structured guidance on research development, grant writing, and

collaboration, thereby enhancing faculty capacity to meet promotion and tenure benchmarks established within their departments.

Research Methodology

This evidence-based practice paper employs a case study design to examine the NHERI Summer Institute, detailing the use of evidence-based instructional strategies—adapted from educational lesson planning and best practices in collaborative and team research—to structure the Institute’s educational activities and engagement for engineering faculty. The case focuses on how these design elements support participants’ professional growth and scholarly productivity.

Given that grant funding is a key criterion for evaluating faculty success at many research-intensive institutions, the research team collected quantitative data on secured grant funding, operationalized as total dollar amounts of awards. These funding data were limited to the National Science Foundation (NSF) to align with the workshop’s emphasis and were collected using the NSF Award Search tool. Because academic advancement is closely linked to research productivity, participants’ promotions were also tracked longitudinally. Promotion data were identified through participants’ LinkedIn profiles and then verified using institutional websites.

Additional data were collected from participants following their involvement in the NHERI Summer Institute to guide ongoing program refinement and assess grant-writing self-efficacy over time. The overarching research question guiding this case study is: How does participation in the NHERI Summer Institute impact the career development and success metrics of early-career engineering faculty?

The Case: NHERI Summer Institute. The Summer Institute is a three-day workshop, supported by NSF, that provides travel awards to a select cohort of approximately 20 participants each year. Participation and associated travel funding are frequently documented on curricula vitae and may be considered during promotion and tenure review processes.

The three-day NHERI Summer Institute is intentionally designed using education best practices, including structured lesson plans, purposeful learning and engagement activities, and formative assessment to improve subsequent programming. Through active preparation, scaffolded tasks that reduce cognitive load, and sustained engagement in collaborative proposal development with other early-career faculty, participants deepen their understanding of NSF proposal writing and the use NHERI resources.

Active Preparation. Prior to attending the Summer Institute, participants complete two pre-reading assignments and associated tasks to promote active engagement with key

texts. Specifically, they read the [NSF NHERI Science Plan](#) to understand the development of transformative natural hazards research (main body), familiarize themselves with example research campaigns from NHERI, identify keys to successful research proposals, and familiarize themselves with the NHERI facilities. Once they have read the Science Plan, junior faculty write questions to clarify their understanding, which is shared with NHERI mentors. These questions are used by NHERI mentors to structure short presentations during the Summer Institute to address participants' learning needs.

Second, participants read the NHERI Technology Transfer Committee's "Mechanisms for Implementation of NHERI Research Results" and construct questions meant to clarify their understanding, which are reviewed by mentors to help them create a short presentation.

These types of pre-assignments build background knowledge and schema that prepare participants to actively engage in discussions and collaborative groups at the Summer Institute (Science Education Initiative, 2014). Pre-reading is a type of "Just-in-Time-Teaching" strategy, introducing foundational concepts in advance of in-person sessions and lowering cognitive load so that participants can allocate higher-order learning during the workshop (Kester, et al., 2006; Science Education Initiative, 2014).

Presentation Sessions. Once junior faculty have actively prepared to attend the Summer Institute, they participate in several short presentation sessions which are followed immediately by active learning sessions. The presentation sessions introduce participants to relevant information, including the eleven NHERI experimental facilities, NSF grant writing, NHERI Science Plan, Broader Impacts, and transferring technology and research into practice.

Active Engagement. Immediately following short presentation sessions, participants are given a question about the session, which provides a focus for their mock proposal work. Within collaborative groups, participants work to answer the questions that will help them come to a consensus about their mock proposal focus. For example, after learning about NSF grant proposals, groups are asked to select one of three grand challenges from the Science Plan and one key question to help them identify their group's intellectual merit.

Results

Learning Outcomes. Qualitative results focused on participants' learning experiences at the NHERI Summer Institute, particularly regarding their increased knowledge of NHERI resources and grant funding. Of the 192 participants who completed the post-assessment, 51% reported learning "a great deal" about the NHERI community and their research activities, 37% reported learning "a lot", 11% "a moderate amount", and 2% "a little." Similarly, of those 192 participants, 67% indicated that they learned "a great deal" about

the NHERI network, their research work, and available resources, while 27% learned “a lot,” 5% “a moderate amount,” and 1% “a little.”

Grant Writing Preparedness. Participants also reflected on their preparedness to develop grant proposals following the Summer Institute. Of the 143 qualitative results captured in the post-assessment, 83% focused on the benefits of grant writing and mock proposal sessions, different perspectives, broader impacts, NHERI Science Plan, mentors, and applying what they learned, 7% shared a positive experience and area the Summer Institute could improve, 10% focused on how the Summer Institute could better support their needs. Those who shared a lack of learning often shared that they had attended many other proposal writing events and were interested in learning more about NHERI.

Qualitative results about grant writing include quotes and overall positive, mixed, and negative perspectives. Of 192 participants who completed the post-assessment, 29% reported feeling extremely prepared to write a grant proposal that would supplement or extend their research, 60% felt moderately prepared, 10% felt slightly prepared, 1% felt neither prepared nor unprepared.

Some quotes that illustrate how the Summer Institute prepared faculty for grant writing include:

“The NHERI Summer Institute gave me a much clearer picture of how to put together a strong grant proposal. I learned what NSF is really looking for, how to align with NHERI’s goals, and how to build a good team. The mock proposal exercise was especially helpful. It made the structure and key elements of a solid proposal click for me. I feel more confident now about pursuing funding for interdisciplinary, hazard-related research.”

This data shows how, after participation in the Summer Institute, early-career faculty recognized the importance of learning from an NSF program officer about the elements of a successful proposal. They learned from faculty who navigated the proposal process in different ways and took ideas that could help them as they developed their own grants.

“I learned SO MUCH about grant proposal writing during the NHERI Summer Institute and found the grant proposal writing/workshop sessions extremely informative. The collaborative grant proposal writing sessions were so helpful for me to think outside the box, as well as to get insight and ideas from other researchers that did not cross my mind. I feel more confident and capable of writing successful grant proposals as a result of the NHERI Summer Institute.”

These statements highlight how faculty gained confidence through active learning and purposeful interactions.

The training was also at the appropriate level of expertise for early career faculty as documented by quotes such as the following:

“The mechanics of beginning to write a grant proposal were very clearly explained and for me personally it was at the correct level of detail. I can imagine for those who are further along their academic careers it may have covered many details they already knew.”

Having experienced mentors work with each group also supported early-career faculty needs:

“During the NHERI Summer Institute, I gained valuable insights into NSF grant proposal writing, including how to craft strong intellectual merit and broader impacts sections, and how the review process works. The hands-on guidance from experienced researchers and interaction with NSF officers made the experience highly informative.”

Additionally, the peer connections, experienced researcher networks, and NSF personnel added multiple dimensions for consideration as early-career faculty developed their collaborative mock proposals.

“It was great. Not only does it help me to learn about writing a grant proposal, but it also provides the opportunity to make connections for interdisciplinary research collaboration. Thank you!”

Hearing from different people and learning about the various times that faculty applied for funding only to be declined for funding helped faculty gain confidence through vicarious learning. The following statements highlight this theme that emerged from participants’ feedback:

“It was great to get so many different perspectives on grant writing at the Institute. As a first-year faculty member, I have so little experience writing grants and advice has come from a select few people. This was invaluable to hear so many different perspectives.”

“The NHERI Summer Institute sessions and discussions with our mock proposal mentors were priceless, and I now feel more confident in writing more lucid proposals in the future. To add to this, the NSF CAREER Awardee Panel made the process seem more accessible and attainable. It was a real morale builder for me.”

As can be seen through these data, faculty overwhelmingly felt prepared as they gained contacts and knowledge about the proposal writing process. Evidence of the long-term outcomes was sought through NSF grant awards.

NSF Funding Outcomes. To assess the longer-term impact of participation, data on NSF funding were collected using the [NSF Awards Advanced Search](#). Only funding secured as a Principal Investigator (PI) or Co-Principal Investigator (Co-PI) after attending the Summer Institute, beginning January 1 of the year after they attended, was included.

As of September 2025, 21% (n.= 39) of participants who participated between 2017 and 2025 had secured one or more NSF awards, totaling 97 NSF awards overall. Collectively, these participants earned approximately \$42.8 million in NSF funding after attending the NHERI Summer Institute, with a mean of \$441,198 per award with a range between an estimated \$75,000 and \$4.46 million. Further, eleven of these funded participants received NSF CAREER Awards.

In comparison, the NSF Engineering Directorate reported a 23% overall funding rate, while the Civil Mechanical and Manufacturing Innovation Division documented a funding proposal rate of 17% (National Science Foundation, 2014).

Career Advancement. The NHERI Summer Institute seeks to build research capacity and competitive grant writing skills, along with the use of NHERI resources, among early-career faculty in academia. To evaluate participants' professional progression, career advancement was tracked based on academic promotions and tenure. In the NHERI Summer Institute participant selection process, the Education and Community Outreach Committee gave preference to participants who indicated a strong interest in an academic career. Table 1 shows career advancements for Summer Institute participants as of September 2025, from graduate students through full professor status.

Table 1. Career Advancement of Summer Institute Participants (Count)

Position		Total	Current						
			Grad Student	Postdoc. Fellow	Ind./ Gov	Untenured	Assist. Prof.	Assoc. Prof.	Prof.
Previous	Grad. Student	45	18	4	8	3	10	2	-
	Postdoc Fellow	29	-	3	7	3	13	3	-
	Ind./Gov.	4	-	-	3	-	1	-	-
	Untenured	4	-	-	1	1	2	-	-
	Assist. Prof.	101	-	-	3	-	70	25	3
	Unknown	1	-	-	-	-	-	-	-

The career advancement categorizes participants as graduate students, postdoctoral fellows, industry and government researchers, untenured track positions (i.e., researchers, lecturers, adjuncts), and tenure track positions (i.e., assistant, associate, and full

professor) to track progress moving from graduate student to full professor. Participants who entered or moved to the next “rung” within the academic ladder were considered promoted. Overall, 42% of graduate student participants were promoted, as were 66% of postdoctoral fellows, 25% of industry or governmental researchers, 50% of untenured participants, and 28% of assistant professors, resulting in an overall promotion rate of 38% across cohorts.

Of the 45 participants who attended the Summer Institute as graduate students, 40% remained in graduate programs, 18% entered industry or government positions, 9% transitioned into postdoctoral fellowships, and one-third entered academia, with 27% securing tenure-track positions. Of the 29 postdoctoral fellows who attended the Summer Institute, 10% remained in fellowship roles, 24% joined industry or government, and 66% entered academic positions, with 55% securing tenure-track positions.

Both graduate and postdoctoral fellows who attended the NHERI Summer Institute were more likely to secure tenure-track positions compared to the national average. Roy, Velasco, and Edwards (2024), using ASEE data, calculated that the number of civil engineering PhD graduates who secured a tenure-track position fell from 19.5% in 2006 to 11.7% in 2018. Similarly, they found that civil and environmental engineering PhD graduates securing tenure-track positions also fell from 32.7% in 2006 to 24.6% in 2008 (Roy, Velasco, & Edwards, 2024).

Table 2. Career Advancement of Summer Institute Participants (Percentages)

Position		Current							
		Total	Grad	Post Doc	Industry/Gov	Untenured	Assistant Prof.	Associate Prof.	Professor
Previous	Graduate Student	45	40%	18%	9%	7%	22%	4%	-
	Postdoctoral Fellow	29	-	10%	24%	10%	45%	10%	-
	Industry/Government	4	-	-	75%	-	25%	-	-
	Untenured	4	-	-	25%	25%	50%	-	-
	Assistant Professor	101	-	-	3%	-	69%	25%	3%
	Unknown	1	-	-	-	-	-	-	-

Of the four participants from industry or government, 75% remained in industry, and 25% transitioned into academia as assistant professors. The majority of participants who attended the Summer Institute are employed as assistant professors or as research or

teaching assistant professors (n=101). Of the four untenured participants, 25% remain untenured, 50% entered industry or government positions, and 25% secured a tenure-track position. Finally, of the 101 assistant professors who participated, 69% remained at that rank (assistant professors), 25% advanced to associate professor, 3% secured full professorship, and 3% moved into industry. Note, one participant's career advancement is unknown and not reported.

Discussion

The findings from this evaluation highlight the NHERI Summer Institute's impact on participants' learning, research preparedness, funding success, and career advancement within academia across nine years of implementation, formative evaluation findings, and long-term success metrics for participating early career faculty. Collectively, these outcomes demonstrate the program's success in fostering early-career faculty development and expanding engagement within the NHERI community. Viewed through the lens of Social Cognitive Career Theory (Lent, Brown, & Hackett, 1994) and Bandura's self-efficacy model (1997), these outcomes suggest that the program fosters environmental supports, skill mastery, and personal agency required for career advancement in academic research.

Participants' strong learning outcomes underscore the effectiveness of the Summer Institute's experiential and community-based learning approach. Over 88% of participants reported learning "a lot" or "a great deal" about NHERI resources, research infrastructure, and community engagement. These learning outcomes reflect performance accomplishments and vicarious learning—two important sources of self-efficacy in Bandura's model (1997). These findings also suggest that the Summer Institute successfully introduced early career faculty to the breadth of NHERI's multidisciplinary research network and reinforced their ability to leverage these resources in their research work.

Equally important, the data indicate positive outcomes in participants' self-efficacy toward grant writing. Nearly 90% felt at least moderately prepared to develop research proposals after the program, with almost one-third reporting that they felt "extremely prepared." Given that proposal development can be a major barrier for early-career faculty, these results indicate that the NHERI Summer Institute enhanced participants' confidence and readiness to compete for research funding. By providing scaffolded instruction and structured, well-aligned learning activities and feedback, the Summer Institute helped translate participants' understanding into actionable grant-writing skills.

Longitudinal tracking provides evidence of the Summer Institute's effects on research productivity and external funding success. Between 2017 and 2025, 30% of Summer Institute alumni secured NSF awards totaling approximately \$42.8 million. These figures represent a significant return on investment in early-career researcher training.

This pattern of funding suggests that the NHERI Summer Institute not only raises awareness of NHERI resources and opportunities but also cultivates the confidence and sustained research engagement that translates into measures important for career advancement. Participants' success as PIs and Co-PIs demonstrates NHERI network's role in fostering collaborative research relationships.

The observed career trajectories of the early career faculty provide further evidence of the NHERI Summer Institute's contribution to academic advancement. The overall promotion rate of 38%, along with strong advancement among postdoctoral fellows and untenured participants, reflects the meaningful progression toward tenure-track and senior academic positions. Particularly notable is the transition of 27% of graduate students and 55% of postdoctoral fellows into tenure-track roles, underscoring the Summer Institute's role as a bridge to academic careers. Transitions into industry and government can be interpreted as diversification of career pathways. The movement across academia, government, and industry demonstrates broader capacity-building influence within natural hazards engineering research.

Implications

Collectively, these findings highlight the NHERI Summer Institute's effectiveness as a socially embedded professional learning environment that fosters career development that translates to career advancement. Some implications for practice include using educational theory and research-based best practices to design professional development programs for early career faculty. Additionally, designing activities that use self-efficacy theory supports fostering confidence in faculty. Some examples of these include providing hands-on training, giving early career faculty opportunities for performance achievement, and providing opportunities for vicarious learning.

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