



What no one tells you about writing a CAREER Proposal: Advice from a former NSF program officer

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Abstract

This paper is designed as a resource for anyone considering writing a Faculty Early Career Development (CAREER) proposal for the National Science Foundation. The paper focuses on three topics that could be considered part of the “hidden curriculum” of successful proposal writing for this program: situating your project within your vision for your academic career, communicating effectively with program officers, and developing a support network for your proposal writing. Examples of career visions are included from Engineering Education CAREER awardees. Writing prompts are included to help prospective investigators develop their own career vision.

Keywords: NSF CAREER, proposal writing, program officer, career vision

Introduction

The Faculty Early Career Development (CAREER) competition is a unique program that requires faculty to develop a special kind of proposal. At its core, a CAREER proposal is a *career development plan* that incorporates integrated research and education plans. The CAREER program is a foundation-wide activity that offers NSF’s most prestigious awards for faculty members beginning their independent careers (NSF 20-525). Awardees are expected to present an integrated research and education plan that will provide the foundation for their careers as researchers and educators.

The goal of this paper is to serve as a resource to help principal investigators (PIs) develop CAREER proposals for any division at the National Science Foundation (NSF). The content of the paper is based on my recent experience as an NSF program officer (2017-2019) in the Engineering Education and Centers Division of the Directorate for Engineering and as a CAREER PI (2010). There are many resources for PIs that focus on NSF’s review criteria and the mechanics of writing a strong proposal. This paper concentrates on three topics that are less often discussed: articulating how your CAREER proposal fits into your career vision and goals; meeting with NSF program officers; and building a network of support for developing the proposal.

1. Articulating how your CAREER proposal fits into your career vision and goals

To write an effective CAREER proposal, you need to articulate how your five-year project fits within your long-term academic career plans and that that you are the *only* person to do the work you propose [1]. Your CAREER proposal should convey how the career development plan you describe is uniquely suited to you.

I recommend including a career vision statement so that the reviewers can quickly get a picture of who you are and what you want to achieve in your academic career. Spelling out the “big picture” question you want to address in your academic career will immediately invoke your

long-term plans. Then explain why you are starting with the particular research, scope, etc. of the proposed project.

1A. How to write a career vision statement

In general, a vision statement is a statement of a future state of being; it is often written in the present tense. As Sussex writes, a career vision statement “defines what success and excellence looks like to you” [2]. Boggs describes a career vision as “a clear mental picture of a desired future state of your career” [3] and that “[I]f you think of your career as a journey, a vision can be thought of as a destination. But this destination should not be thought of as a final resting place, but a dynamic future state.” [3].

Boggs further characterizes career visions as having the following characteristics:

- Compels you to act
- Inspires and motivates you to be committed to excellence
- Is easy to understand
- Provides direction and focus for every decision
- Invokes a mental picture of who you are, where you are going, and what you will do to get here
- Is future and action oriented
- Is unique
- Is not easily achieved

The excerpts in Table 1 (used with permission of the CAREER awardees who wrote them) illustrate how Engineering Education CAREER awardees have stated their career or research vision:

Table 1. Engineering Education CAREER awardees’ long-term career visions (emphases theirs)

The PI’s career vision is to be a national catalyst for change in increasing the diversity of students in engineering. [4]
Dr. Morgan M. Hynes is working toward a vision that <i>all</i> students have an opportunity to <i>engage</i> in <i>engineering</i> . [5]
These project goals substantially advance <i>my larger career goal</i> : to do innovative, strongly grounded research that helps build engineering education institutions around the lives of diverse students. [6]
My passion and career goal is to address the critical need to increase creativity in engineering by encouraging neurodiversity, specifically by promoting the participation of students with Attention Deficit (Hyperactivity) Disorder (ADHD/ADD). [7]
The PI seeks to become the leading expert in adaptive decision-making among students in academic settings, particularly as they choose majors into, out of, and within engineering and make daily choices that influence their academic and personal success. [8]

My long-term goal is to develop a model of engineering education founded on an empirically supported engineering learning theory utilizing my unique combination of engineering design experience and background in engineering education and the learning sciences. [9]
My mission is to change the way engineering conceptualizes, teaches, and shows value for skills that have traditionally and conventionally been considered “additional,” but are in fact vital skills for engineers. I want to demonstrate value for differing ways of engineering thinking and encourage diversity of ideas as a norm in engineering work. [10]
My long-term goals are to: 1) lead the creation of a new area of scholarship focused on gendered socialization in engineering, and 2) increase <i>studying up</i> within engineering education research. [11]
PI Berdanier’s overarching goal is to become a leading expert in graduate engineering attrition and engineering Master’s-level education. [12]
My academic career goal is to develop my expertise in assessment and measurement in engineering education using unconventional mixed-methods approaches. [13]
My career goal is to bring [liberative pedagogies] to engineering education and encourage their widespread use in curriculum development. Moreover, I seek to be part of a paradigm shift that these pedagogies demand, repositioning concerns about underrepresented minorities and white women from a superficial measure of equity as a simple headcount, to a question of basic justice, wherein the genuine engagement of women and other underrepresented students is included in the core educational mission. [14]
The PI aims to become the leading expert in framing agency and the role it plays in learning and innovative design. [15]

1B. Writing prompts for your career vision statement

Of course, you need be clear about your career goals before you can articulate them to someone else! The following writing prompts come from a variety of career resources but are organized according to the five steps to writing a career vision listed on the career website Indeed.com.

1. *Identify your strengths.* What are you really good at? What makes you tick? I have found that taking the CliftonStrengths Assessment (<https://store.gallup.com/p/en-us/10108/top-5-cliftonstrengths>) has given me ways to talk about my strengths—Focus, Achiever, Learner, Significance, Futuristic—whether I use their language or use the themes as starting points for describing myself using my own words.

Writing prompts:

- What are some strengths of yours that other people have commented on, and how have these strengths affected your accomplishments? [16]
 - Do you feel as though you have a gift or calling? How can you share this gift or best answer the call in a way that will fulfill you? [17]
2. *Reflect on your values.* My core value is relationships. Indeed.com suggests that you might also ask the people who know you best what they believe you value.

Writing prompts:

- What are the 10 things you most enjoy doing at work? [16]
 - What are you really passionate about?
 - What are three things you must do every single day to feel fulfilled in your work? [16]
 - What are your 5-6 most important values [16]
3. *Evaluate how your skills can solve real-world problems.* I would add “in [my field]” to that. That is, how will you use your skills, strengths, and values to solve a big problem in your field?

Writing prompts:

- What issue do you care about the most? If you could solve one problem in your field, what would it be?
 - If absolutely no obstacles stood in the way of your achieving it, what would you most like to attain in your career? [17]
 - What makes you distinctive in your current work? Can you leverage that uniqueness to achieve a future you desire? [17]
4. *Select your desired position within your field.* What role do you want to have in your chosen field? Think bigger than a job title here! Your vision, and therefore your role, will likely evolve over time. In my 2009 vision, my role was “catalyst”; in my 2019 vision, my role is “champion.”

Writing prompt:

- How do you want to enact change in your field?
 - Imagine that your institution or ASEE gives you a plaque at retirement; what do you want it to say?
 - Imagine yourself in the future at a point in which you have achieved great career success. What is it that you have accomplished? What does your life look like? [17]
 - How do you define career success? [17] What would your career be like if you had the power to make it any way you wanted? [17]
 - Where would you like to be in your career in 10 years? In 20 years? [17]
5. *Write out your vision statement.*
Indeed.com suggests you seek to “keep the statement concise while giving enough detail to make it unique.” My own are below.

- 2009 The PI’s career vision is to be a national catalyst for change in increasing the diversity of students in engineering
- 2019 My career vision is to champion a more equitable system of engineering education that is inclusive of diverse learners, teachers, and researchers.

Likewise, Denise Simmons [18] has updated her career vision since she wrote her CAREER proposal:

- 2014 To become a global leader in research that builds capacity and broadens the participation of students completing engineering degrees and entering the technological workforce by shaping practices and policies in retention, informal learning, pedagogy, professional competency, workforce development and life-long learning.
- 2020 My integrated research, teaching and service goal is to be a thought leader in the professional formation of civil engineers, with a specific focus on project managers and the practical strategies that transform and sustain inclusive and productive organizations.

Alice Pawley[6]’s career vision has also evolved in the years since she wrote her CAREER proposal.

- 2010 To do innovative, strongly grounded research that helps build engineering education institutions around the lives of diverse students.
- 2020 To help people, including the engineering education profession, develop a vision of engineering education as more inclusive, engaged, and socially just.

There are advantages of writing your career vision beyond your CAREER proposal’s success. I keep mine taped on my computer monitor so I can see it every day and let it guide my decisions. When an opportunity arises, I look at the vision and ask myself whether it would get me closer to my vision. When the answer is no, I generally decline the opportunity. If it does get me closer to my vision, I evaluate whether I have the capacity to do it now, later, or never.

Another advantage to keeping your vision statement visible is that it reminds you to tweak it. As shown above, between 2009 and 2019 my focus went from “students” (only) to “learners, teachers, and researchers” and from “diversity” to focus on an “equitable system.” I became far more ambitious as I matured in my career, as my vision statement reflects.

1C. Long Term Research and Education Goals

The previous section showed some examples from CAREER PIs that included a specific career vision statement. I believe that doing so increases chances of success, although some awardees have omitted a specific vision statement while still discussing the long-term goal of their research or career development plan. It can be helpful to include both, and articulating such a goal or plan can support success. Four examples appear below:

My research vision is to characterize how latently diverse students experience the culture of engineering and negotiate their identities as engineers. In doing so, I can actualize the power of students’ alternative mindsets and ways of thinking. [19]

The long-term goal of my research program initiated by this project is to cultivate, catalyze, and systemize a much-needed theoretical discourse within the engineering education research community around research quality in qualitative or interpretive approaches. Through this CAREER-funded project, I will make a significant contribution to the theoretical methodological foundation necessary to promote the broad adoption, rigorous implementation, and wider acceptance of interpretive research methods within and beyond the engineering education community. [20]

The long-term goal of this CAREER development plan is to establish an integrated, evidence-based program of research and education centered on how people develop model-based reasoning through authentic modeling and simulation practices in engineering, and to use this knowledge to develop learning strategies that will prepare the next generation of scientists and engineers to be capable of addressing complex interdisciplinary problems. [21]

My short-term goals are:

- To develop a procedure to assist in the facilitation and measurement of effective teams;
- To offer a user friendly protocol for engineering faculty members desiring to incorporate teams into their curriculum;
- To ensure that students are provided an opportunity to develop their ability to function on multidisciplinary teams.

My long-term career goals are to move into an administrative position that would allow me to continue working directly with students and to concentrate on techniques and strategies to enhance student learning as an academic leader. In addition, I would be able to develop teams with administrators, faculty, staff and students for their benefit and for the good of the university. The effective teaming research and education activities described in this proposal are a natural extension of my previous work. They will have a lasting impact on my career and the educational environment because they will build a firm foundation for my future development of innovative courses, curriculums and programs to meet the innovative courses, curriculums and programs to meet the needs of engineering students in the 21st century. [22]

1D. Articulating your trajectory and unique qualifications

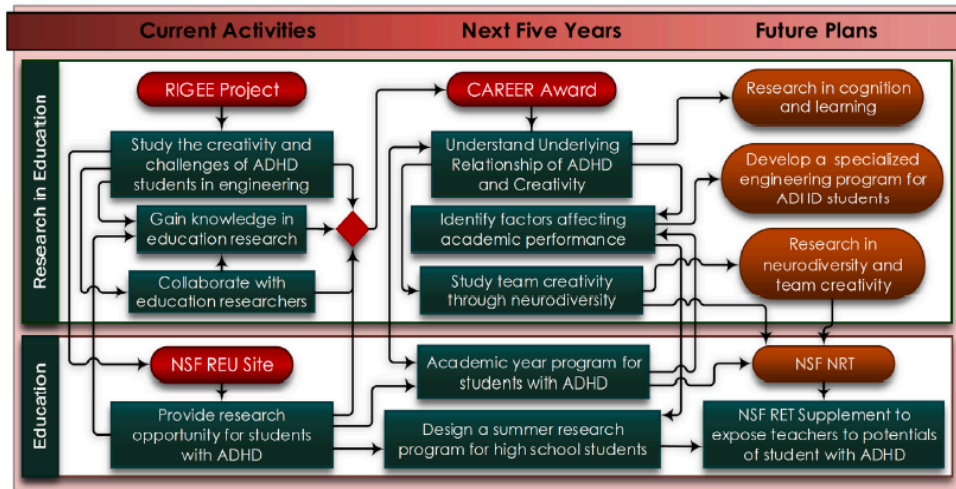
A great CAREER proposal will describe why you are uniquely situated to do the work you propose. As a program director, I told prospective PIs that if I could replace their name with another researcher with similar qualifications and be confident that the project would still be successful, it was not really a CAREER proposal. Some CAREER PIs have effectively used tables or figures for further articulation of their research and/or education goals. For example, Catherine Berdanier reminded her readers that she was “uniquely positioned” to realize her vision of “becom[ing] a leading expert in graduate engineering attrition and engineering Master’s-level education” because she is “one of the few scholars” who has “focused solely on graduate-level engineering education research through her PhD and into her faculty career.” She sketched her educational background and pointed out she has been “a pioneer for engineering education in the Mechanical Engineering program” at her institution (Penn State) and that she “is the Director of the Online Master’s of Science in Mechanical Engineering (MSME) program” as well as completing research that “comprises rigorous engineering education research” [12]. She included a table that mapped out how the proposed project would “leverag[e] both of her disciplinary identities to launch her 5- and 10-year career goals” and articulated her plan to “bring together the communities of mechanical engineering and engineering education to affect change in graduate engineering education.” The table she used appears below in Table 2.

Table 2: Summary of short- and long-term professional goals

	Short-term (5-year) Goals	Long-term (10-year) Goals
Research	<ul style="list-style-type: none"> •Explore predictive causal configurations for attrition •Model attrition via quantitative time-series analysis •Capture and compare perspectives of attrition between departers and faculty •Develop research expertise on the engineering Master’s degree 	<ul style="list-style-type: none"> •Extend research to investigate the experiences of international students, and other disenfranchised subgroups of graduate students •Continue to validate causal configurations for QCA on larger sample sizes •Graduate engineering education policy research
Education	<ul style="list-style-type: none"> •Connect the disciplines of mechanical engineering with engineering education research •Deploy workshops and resources for groups of people most affected by doctoral attrition, especially students from underrepresented groups •Lead transformative workshops for faculty impacting their understanding of graduate student experiences 	<ul style="list-style-type: none"> •Continue teaching both mechanical engineering courses (e.g., graduate thermodynamics) and introduc[tory] courses on educational theory •Offer graduate mentoring workshops for students and faculty on increasingly visible stages •Serve on university and national committees to critique and improve graduate education policy

Arash Zaghi [7] included a figure of his current activities, plans or the CAREER project, and future plans to demonstrate his unique qualifications.

In the long-term, this CAREER award will empower me to establish myself as an expert in engineering education for students with high potential, but at a high risk of academic failure—with a particular focus on students with ADHD (Fig. 1).

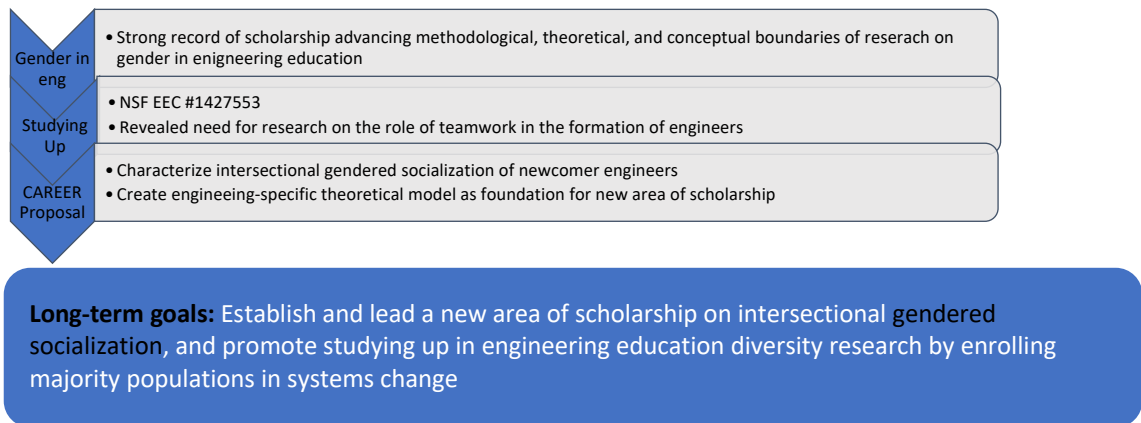


Kacey Beddoes [11] referenced the “unique expertise in gender and engineering education research” she had gained over the preceding six years, pointing out she has “a strong track record

of leadership in research that addresses the limitations of current approaches to studying women in engineering, overcomes the tendency to study down, and unites engineering education with insights from other fields.” She described “a demonstrated trajectory of research focused on advancing the theoretical, methodological, and conceptual boundaries of engineering education research on gender” across eight papers she had authored or co-authored and pointed out she had been “advocating the need for engineering education research to engage a wider range of gender theories, including intersectionality, masculinity studies, and interactional theories of gender.” She rounded out her case for being the best person to complete the proposed research by pointing out she was “co-author[ing] the Society of Women Engineers annual literature review” at the time and “serv[ing] as Deputy Chair for the European Society for Engineering Education Working Group on Gender and Diversity [and as] lead guest editor for a forthcoming special issue of *European Journal of Engineering Education*.” She described an NSF grant for which she was serving as PI, “investigating what and how engineering professors think about gender in engineering (education)” and the implications of that project. She linked the project to the proposed project, pointing out it “builds directly on [her] prior activities.” Her long-term goals statement read:

- 1) lead the creation of a new area of scholarship focused on gendered socialization in engineering, and
 - 2) increase *studying up* within engineering education research.
- Ultimately, these goals can facilitate greater equality in the socialization of newcomer engineers and decrease attrition from engineering careers. The project proposed herein begins the long-term work of meeting those goals by creating an empirically-supported and *engineering-specific model* of gendered socialization. Understanding the ways in which socialization of newcomer engineers is gendered will constitute the beginning of a model of gendered socialization that simultaneously advances the fields of engineering education, gender studies, and organizational studies.

Beddoes then provided an illustrative figure:



2. Meeting with NSF program officers

When I was at NSF, I requested that PIs send me a one-page (no more!) draft summary of their project, including a header with the program name (e.g., CAREER) and their last name. I also asked them to send me 2-3 burning questions. Then, I scheduled a 15 min meeting to discuss my suggestions and answer their questions. Because I knew their top questions ahead of time, I could ensure that I would be able to answer them in the allotted time. Not only could I look up an

answer if necessary, but this advance planning gave me time to consider how the PI could improve their project and think of questions reviewers might have. If you do not have different specific instructions from your program officer, communicating in the format I requested may well be effective. Along with the questions I suggest sending about five possible meeting days/times so that you can schedule a conversation with the fewest possible back-and-forth emails. Bear in mind NSF is in the Eastern Time Zone, so you should propose times according to that zone.

Communicating with NSF program officers before submission is a crucial part of the development process for a CAREER proposal. This process will allow you to ensure that your idea is a good fit for a particular program or division to which you plan to submit. As a program officer, I encountered a few situations where PIs did not follow my guidelines before they submitted their CAREER proposal to my program, and the topic was not in my program's scope. If they had sent me a one-page summary while they were developing the proposal, I could have quickly advised them to submit to another program. Another PI submitted a CAREER proposal whose budget was way out of line with what my program typically funded. Here as well a quick conversation could have cleared up their misunderstanding and increased the chances of that project being funded.

When communicating with program officers, it is important to clearly articulate what you are asking for. Some PIs would send me a one-page summary and just ask for "feedback." This lack of specificity isn't helpful. Decide what type of feedback you need. Do you want to understand if the scope of the project is appropriate? Do you need feedback on the dissemination plan? Do you need guidance about what the panel will be looking for in an advisory board? Do you want to know if you have framed your idea in a compelling way? Sending your most pressing questions in advance forces you to be able to articulate your goals for the meeting. At the same time, you can ask for general feedback with a final question such as: Is there anything else you think I should be considering?

Program officers will make verbal suggestions that they would not put in writing in an email. The most important thing PIs can do during a conversation with a program officer is to LISTEN. The biggest mistake I saw PIs make in talking about their CAREER projects with program officers (other than not talking to them) was spending their limited meeting time trying to make a convincing case that their idea is exciting. This is another reason why sending your most pressing questions ahead of time helps; you can be focused on listening to the program officer's advice rather than trying to get through the list of the things you want to ask. When they are talking, listen, take notes, and do not interrupt!

To prepare to request a meeting with your program officer, you could ask yourself:

- Am I aware of what their division/directorate funds? (For example, I was in the Directorate for Engineering; I couldn't fund projects about STEM in general.)
- Have I asked a trusted colleague and possibly a professional editor to review my one-page summary?
- Can I articulate what I need from the meeting? (My most pressing questions/concerns)
- Have I provided several possible meeting times over the next few weeks?

3. Building a network of support for developing the proposal

Writing a CAREER proposal can be more challenging than other types of writing because PIs are writing about their most precious ideas and long-term career goals. In other words, it is *personal*. Many successful CAREER PIs have stressed the importance of enlisting support for the writing and development process.

One of the best ways to begin to grow your support network is to serve on a review panel at NSF. Contact a program officer to volunteer to serve on an in-person review panel the year before you submit your CAREER proposal. It can be especially helpful to program officers to hear from prospective reviewers close to a solicitation deadline (when they are thinking of forming panels). Send your 2-page NSF-style biosketch so the program officer can determine if your background is a good fit for the needed panel(s). Being on a panel when planning your CAREER proposal is especially helpful if you have never served before. First, it gives you a good reason to go to NSF headquarters and meet with program officer(s). Second, being on a panel will help you begin to imagine the conversation around the table when your CAREER proposal is reviewed. Third, you are likely to meet great people from different academic backgrounds who have the potential to become part of your CAREER support network.

Support networks for writing your proposal may include former CAREER winners, more experienced colleagues, mentors, a writing coach, and an editor.

- **Former/current CAREER awardees:** CAREER PIs from your field are some of the best resources there are for writing your proposal. When I was writing my proposal, I took a lot of former PIs to coffee at conferences, scheduled calls, and requested their proposals as examples. PIs should be willing to share with you; do not be shy about asking! Seeing multiple different ways former awardees had organized their proposals, described their career visions, and articulated the importance of their work to the field helped me think about various ways I could write and organize my proposal. Ultimately, I used their advice and examples to figure out a way to articulate my vision and career development plan in a way that was unique to me.
- A **mentor** is someone who is invested in your success. A mentoring relationship is characterized by trust. Like **trusted colleagues**, mentors use their own experience to provide advice on a particular aspect of a proposal that fits their expertise, such as detailed advice about the methodology or theoretical framework. Mentors might be able to recommend people in their professional network to assist PIs, such as recommending an editor or writing coach. Asking a mentor or trusted colleague who has served on review panels can give you another perspective of what the conversation around your proposal might be like. A mentor also might provide emotional support, encouragement in addition to tangible (instrumental) resources.
- A **writing coach** is like a personal trainer for writing. A good coach can provide accountability as you develop your proposal, they can help you organize and plan your writing time, rise above feelings of being overwhelmed, help you focus, provide encouragement, guide you through parts of the proposal that you are struggling with, help you hone your argument, and more.
- An **editor** can provide line editing, reading for coherence, verb tense, arguments, grammar, and more. One difference between a coach and an editor can help you with text

you have already written, whereas a coach can help you figure out what you want to write.

- A **critical friend** is someone who is supportive and yet provides honest critique to help you improve your work. Former awardees, mentors, trusted colleagues, writing coaches, and editors may serve as critical friends.

4. Final Thoughts

It is my hope that you can use the information in this paper to help you frame you how your CAREER project research and education plans fit into your long-term career vision and to seek advice from NSF program officers. Intentionally building a support network for writing will undoubtedly help you throughout your academic career. Happy writing!

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