NATIONAL SCIENCE FOUNDATION
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Frequently Asked Questions (FAQs) for PD 15-1340, Research in the Formation of Engineers (RFE)

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19. I have a project with several partners. Should I include them as co-PIs, consultants, or submit collaborative proposals?

OVERALL PROGRAM GOALS

1. **What are the overall goals of the RFE program?**

   The RFE program focuses on understanding engineering formation from an engineering perspective and is a part of the overall Professional Formation of Engineers (PFE) initiative. PFE

refers to the formal and informal processes and value systems by which people become engineers. It also includes the ethical responsibility of practicing engineers to sustain and grow the profession in order to improve quality of life for all peoples. The engineering profession must be responsive to national priorities, grand challenges, and dynamic workforce needs; it must be equally open and accessible to all.

Professional Formation includes, but is not limited, to:

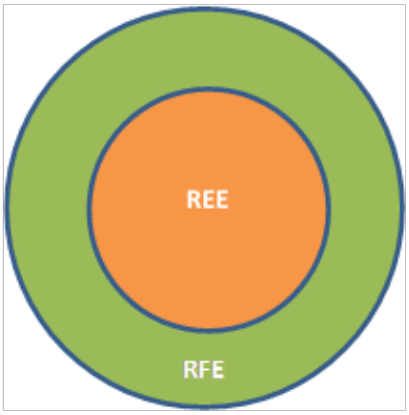
- Introductions to the profession at any age;
- Acquisition of deep technical and professional skills, knowledge, and abilities in both formal and informal settings/domains;
- Development of outlooks, perspectives, ways of thinking, knowing, and doing;
- Development of identity as an engineer and its intersection with other identities; and
- Acculturation to the profession, its standards, and norms.

The RFE program supports research to help engineering faculty, educators, and administrators better understand the professional formation of engineers, effectively engineer desired changes, and produce more qualified engineers and a better informed public.

Research is welcome that considers the construction of engineering knowledge, engineering identity, and the engineering profession, as well as interventions that expand the boundaries of each of these. Ultimately RFE aims to transform the engineering education ecosystem, and thus the impact of proposed projects on this ecosystem should be described.

2. **How does RFE differ from the previous Research in Engineering Education (REE) program?**

RFE is intended to broaden the range of research topics in the field while remaining inclusive of topics addressed under REE. While REE was focused on how individuals learn and later on engineering education ecosystems, RFE includes these and all other aspects of engineering formation, including but not limited to advancing holistic engineering formation; diversifying pathways to and through engineering; exploring citizen engineering, credentialing, and expertise; developing engineering-specific theories of how engineers are formed; and understanding how change in engineering formation processes travels, translates, transfers, diffuses, and/or scales. According to Michel Fabre, "To form is more ontological than to instruct or educate, for one's entire being is at stake" (trans. G. Downey).[1] Processes of formation are holistic and carefully attend to how knowledge and personhood interrelate in the larger context of one's life.[2]

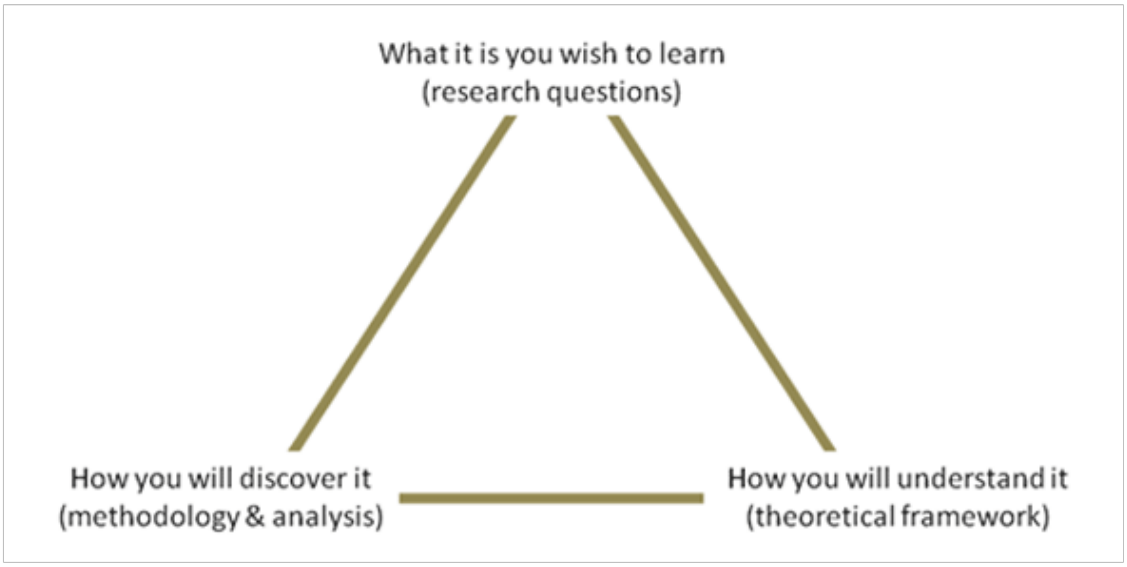


3. **How do I determine if my project is a good fit to the RFE program?**

The best way to determine if your ideas fit the program is to contact the cognizant program director

via e-mail or by phone. All potential PIs are strongly encouraged to contact the program director prior to proposal preparation.

Successful RFE projects clearly discuss what they wish to learn, how the knowledge will be discovered, and the theoretical basis that will allow necessary insights. These three elements should be as aligned with each other as possible, as shown in the figure below, for the proposal to be competitive for funding.



4. **Five areas of interest are listed in the program description. Does my proposal have to address one of these five areas?**

   The five areas outlined in the project description give broad, overlapping, and synergistic areas of interest for the RFE program. Many research topics in engineering formation overlap one or more of these areas. However, worthy ideas outside these areas are actively sought. All potential PIs are strongly encouraged to contact the program director prior to proposal preparation to discuss ideas.

5. **Can you provide additional details on the types of projects that fit into the five areas of interest in the program description?**

   The RFE program seeks to support the best community-generated ideas that will both advance the frontiers of knowledge and inform beneficial changes to engineering formation. Across these five areas and the entire domain of engineering education research, the RFE program encourages risky, highly transformative, "blue sky" ideas that can inform significant and disruptive change.

PROPOSAL PREPARATION AND SUBMISSION

6. **I can't seem to find the proposal solicitation document on the NSF web site. Where is it?**

   RFE (PD 15-1340) is a program description, instead of a program solicitation. All pertinent details about the program can be found on the Research in the Formation of Engineers program description web site: https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503584. Proposals to NSF must be submitted electronically via either the NSF FastLane System or Grants.gov.

   Proposals submitted via FastLane should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the

GPG is available electronically at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Proposals submitted via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide).

7. **Does this program fund initial investigations only, or can I propose to continue a project that is ending?**

   Renewal of existing projects will be considered. To be competitive for continued funding, results from the prior project must be discussed and a strong case for continuation of the research be made based on prior results. PIs are also encouraged to address how the project will be sustained after NSF's support with the continuation funding, particularly how other funding sources will be identified and implemented. Any proposal submitted must be responsive to the current program description and meet the National Science Board approved merit review criteria.

8. **I have an idea to create a new course, series of courses, or laboratory for engineering students. Can this be funded through the RFE program?**

   This is not a high priority area for funding. The RFE program funds *research* in engineering formation that is generalizable and/or transferable. If the course(s)/lab will be the vehicle through which the research is done, then a better case for funding can be made. The review of the proposal will be based on the research, however, not on the novelty or importance of the course(s)/lab.

9. **What are the most common issues with RFE proposals that reviewers identify?**

   In no particular order:

   - The PI fails to provide a roadmap for eventual impact.
   - Insufficient description of prior related work. The proposal fails to place the work in the context of existing literature and/or to make a case for why the work will add coherently to this literature.
   - No clear research question.
   - A research question that is too broad. The proposal does not focus on a question that can be investigated given the constraints of time or resources available to the project.
   - A course/lab/curriculum development proposal that does not advance understanding of engineering formation.
   - The methodology and/or research plan are deficient. For example, a quantitative tudy is proposed but the number of subjects is likely not sufficient for significant effects to be discerned. Quantitative proposals should discuss the statistical power of their experiment. Qualitative proposals are welcome; statistical power considerations are not relevant but proposals should address methodological details appropriate to the methods. For mixed methods, proposals hould address how the two approaches inform one another.
   - Lack of an appropriate theoretical framework that will be used in the research.
   - The project does not clearly identify how the work draws from practice and/or does not clarify how practitioners will utilize the research results to impact professional formation of engineers.
   - Failure to identify an appropriate audience for the research results and dissemination plans. For example, many proposals state they will publish in engineering education journals, but a more effective audience for the results are administrators or staff who do not regularly read these journals.
   - Not having the right team to achieve meaningful dissemination.

- No clear value proposition is stated.

10. **Is an external evaluator required on RFE proposals?**

    The need for external evaluators depends on the size and complexity of the project. While project evaluation is always beneficial, it may not be suitable for smaller projects. Contact the cognizant program director if you have questions.

11. **Are interdisciplinary partnerships required on RFE proposals?**

    Engineering formation is inherently an interdisciplinary topic. Most engineering formation research projects require both technical engineering knowledge as well as knowledge from cognitive/education and other social sciences. Interdisciplinary partnerships are beneficial, especially when an individual investigator does not possess all relevant areas of expertise.

    Large projects with multiple partners and outcomes may not only need faculty from several disciplines, but external evaluators, project managers, and individuals who can help ensure that the project has meaningful impact. If you have questions, please contact the program director.

12. **Can I submit more than one proposal or serve as a PI on one proposal and a co-PI on a different proposal?**

    Yes. There is no limit on proposals per PI or institution. However, funds are limited in the RFE program. Contact the cognizant program director with any questions.

13. **I am part of an NSF research center which includes an education mission. Can I submit a RFE proposal?**

    Yes. However the proposed RFE research must address research questions not already funded in the center's award. We particularly encourage submissions from ERCs in their early phases since the ten year mission of ERCs allows longitudinal studies to be conducted that are difficult to perform otherwise.

14. **What are the duration limitations on RFE projects?**

    There is no specific limitation on the duration of the awards other than limitations included in the Grant Proposal Guide (GPG). The proposed duration should be consistent with the scope of the proposed effort and the funding requested. Typically projects are 2 to 4 years, and exploratory projects are typically somewhat shorter.

15. **Are RFE proposals eligible for supplements?**

    Except in specific circumstances that bar supplemental funding, RFE projects may request supplements.

16. **What funding opportunity number do I choose on Fastlane or Grants.gov?**

    Submit to PD 15-1340.

17. **What is the upper (lower) limit on what I can request for my project?**

    Proposals are evaluated based on their value; value is defined as the potential benefits relative to the project's cost. To determine the potential benefit, proposals are rated on both their intellectual merit and potential for broader impacts. The cost of the proposal is determined from the budget.

PIs are encouraged to explicitly state the value proposition of the proposed work, and ensure a high value by maximizing potential benefits while minimizing costs.

This approach allows small, exploratory projects with low costs to have high value while at the same time allowing larger projects with large benefit to have proportionally higher costs and maintain a high value proposition. Small, exploratory, and speculative projects with a clearly stated value proposition are encouraged in this program.

18. **Fifteen pages is not enough space to fully describe the project. Are appendices allowed?**

    No.

19. **I have a project with several partners. Should I include them as co-PIs, consultants, or submit collaborative proposals?**

    This is up to the PI and the organization(s) submitting the proposal based on what is most suitable for the proposed project.

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[1] Michel Fabre, *Penser la Formation*. Paris: Presses Universitaires de France, 1994.

[2] Gary Downey, Professional Formation of Engineers, Keynote delivered at NSF EEC Engineering Education Awardees' Meeting, September 29, 2014.