



National Science Foundation
4201 Wilson Boulevard
Arlington, Virginia 22230

NSF 14-081

Dear Colleague Letter: Research and Development on STEM Teaching and Learning in CAREER Proposals

Dear Colleagues:

The Faculty Early Career Development (CAREER) Program is a National Science Foundation-wide activity that offers awards in support of faculty early in their independent research careers. The purpose of this letter is to clarify the guidelines included in Program Solicitation [NSF 14-532](#) and subsequent versions as they relate to proposals submitted to divisions and programs within the Directorate for Education and Human Resources (EHR).

EHR is committed to a vision of a healthy and vital national science, technology, engineering, and mathematics (STEM) education enterprise. The directorate works toward this vision through its mission, which is to support research and development on STEM education and learning and to engage and grow a diverse, STEM-literate citizenry ready to advance the frontiers of science and innovate for society. A portion of the EHR investment is strategically aimed at research to understand STEM learning and education.

PROGRAMS AND DIVISIONS

Programs within EHR emphasize different categories of research and development activities. When submitting a CAREER proposal to EHR, investigators need to indicate the program to which the objectives of their proposal most closely align. Programs within EHR that accept CAREER proposals include:

- **Advancing Informal STEM Learning (AISL):** Division of Research on Learning in Formal and Informal Settings
https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504793
- **Discovery Research K-12 (DRK-12):** Division of Research on Learning in Formal and Informal Settings
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=500047
- **EHR Core Research (ECR):** (all divisions)
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504924&org=EHR

Proposals aimed at building fundamental knowledge in any STEM education research field should be submitted to the EHR Core Research (ECR) program. As described in the [Frequently Asked Questions \(FAQs\) for NSF 13-103](#), proposers are encouraged to state the primary ECR area(s) on which their proposal focuses in both the project summary and the project description; these core areas include: STEM Learning, STEM Learning Environments, STEM Workforce Development, and Broadening Participation in STEM.

- **Improving Undergraduate STEM Education (IUSE):** Division of Undergraduate Education
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504976&org=DUE&from=home

- **Innovative Technology Experiences for Students and Teachers (ITEST):** Division of Research on Learning in Formal and Informal Settings
https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5467

FEATURES OF CAREER PROPOSALS

A recent review of CAREER proposals submitted to EHR indicates the need to call potential investigators' attention to the following key features of proposals submitted to any program:

Research Design and Methodology: CAREER investigators are expected to propose research methods that are well justified and suited to the research questions being studied, and are likely to yield significant knowledge in pursuit of the relevant core problems in STEM education. The *Common Guidelines for Education Research and Development*, jointly developed by the National Science Foundation and the Institute of Education Sciences in the U.S. Department of Education, describes six types of research studies that can generate evidence about how to increase student learning. For each research type, there is a description of the purpose and the expected empirical and/or theoretical justifications, types of project outcomes, and quality of evidence. The *Guidelines* publication can be found on the NSF website with the number [NSF 13-126](#). Investigators are encouraged to familiarize themselves with the *Guidelines* and use the information therein to help in the preparation of CAREER proposals to EHR.

CAREER proposals to EHR should meet the following basic requirements:

- Investigators should pose research problems of compelling importance deeply rooted in one or more STEM fields. Proposed research methods must closely align with clear, specific research questions.
- Investigators must demonstrate how the proposed research plan builds upon existing theory and evidence from relevant fields. Proposals must draw broadly on the current education-relevant literatures and also on the specific literature in any STEM domain of central focus.
- Investigators must explicitly describe the research design, including underlying methodological assumptions, targeted population and sampling, measures and instruments, and data gathering and analysis plan. Data collection procedures should be well specified, particularly with information on the reliability, validity, and appropriateness of proposed measures and instruments or particular plans for establishing them if not initially known.
- Quantitative research should include statistical methods to be used, details on how potential threats to internal and external validity will be addressed, power analyses demonstrating the adequacy of proposed sample sizes, and estimates of effect sizes, as appropriate. Qualitative studies should include procedures to collect, code, reduce, and analyze data, and specific conceptual frameworks that will guide analysis.
- Reporting pilot results and providing examples of anticipated findings that might result from the proposed studies will strengthen the competitiveness of proposals.

Integration of Research and Education: Proposals are expected to clearly describe substantially integrated research and education plans with the goal of making advances in both domains. While EHR recognizes that there is no single approach to an integrated research and education plan, investigators are encouraged to propose innovative strategies that demonstrate creativity and innovation about how their research will impact their education goals and, conversely, how their education activities will feed back into their research. Please note that simply conducting research on education issues is not sufficient to integrate research and education efforts. Please see the Frequently Asked Questions about the CAREER program ([NSF 11-038](#)), specifically related to the [expectations of the level of activity for the education component](#).

Advisory Boards: CAREER proposals submitted to EHR may include advisory boards, including

experts from the fields represented in the proposals to ensure appropriate advice, oversight, direction of the proposed scopes of work, and/or evaluation of the impact of the research and education activities.

To request additional information and further clarifications, please access the CAREER EHR Directorate and Division Contacts at <http://www.nsf.gov/crssprgm/career/contacts.jsp>.

Sincerely,

Joan Ferrini-Mundy
Assistant Director
Directorate for Education and Human Resources