



NATIONAL SCIENCE FOUNDATION
2415 EISENHOWER AVENUE
ALEXANDRIA, VIRGINIA 22314

NSF 19-044

Dear Colleague Letter: Fundamental Discipline-Based Education Research (DBER) Focused on Undergraduate and Graduate STEM Education within the EHR Core Research (ECR) Program

February 27, 2019

Dear Colleagues:

The EHR Core Research (ECR) program of National Science Foundation's (NSF) Directorate for Education and Human Resources (EHR) wishes to notify the community of its intention to support, through EHR Core Research (ECR) program solicitation [NSF 19-508](#), fundamental discipline-based education research (DBER) focused on undergraduate and graduate Science, Technology, Engineering, and Mathematics (STEM) education. The NSF intends to foster DBER to develop foundational knowledge in STEM education at the undergraduate and graduate levels in each of ECR's three tracks: STEM Learning and Learning Environments, Broadening Participation in STEM, and STEM Workforce Development.

DBER is defined as "an empirical approach to investigating learning and teaching that is informed by an expert understanding of [STEM] disciplinary knowledge and practice".^[1] DBER addresses complex problems in STEM education by integrating expert knowledge of particular STEM disciplines' models, theories, culture and educational challenges with relevant models, theories and research methodologies from a variety of fields such as education, the learning sciences, psychology, and many more. With this Dear Colleague Letter (DCL), NSF invites proposals that request support to conduct fundamental DBER (basic or use-inspired) focused on developing and testing models or theories in undergraduate or graduate STEM education, including all areas of STEM supported by NSF including interdisciplinary or convergent topics.

As described in ECR solicitation [NSF 19-508](#), the program will support a wide range of fundamental research activities in STEM education. As outlined by the National Research Council (NRC) DBER report, some key goals of DBER include, but are not limited to, understanding how people learn the concepts, practices, and ways of thinking in particular STEM disciplines; understanding the nature and development of expertise in a discipline;

identifying and measuring appropriate learning objectives and instructional approaches for a particular STEM discipline; contributing to the knowledge base in a way that guides the translation of DBER findings to classroom practice; and identifying approaches to make STEM education and the STEM workforce broad and inclusive. With respect to broadening participation in STEM, DBER research is needed to develop and test theories that contribute to the understanding of the effects of discipline-based education strategies on the culture of STEM classrooms, student affect, persistence, graduation, and learning outcomes of women and underrepresented racial and ethnic minorities within and across different STEM disciplines. In addition, the 2018 report on *Graduate STEM Education for the 21st Century* recommends research to better understand graduate STEM education including, but not limited to, the effects of the several models of graduate education on student knowledge, competencies, mind-sets, and career outcomes; and studies on how the various STEM disciplines can integrate the changing scientific enterprise into graduate education.[2] ECR is also interested in supporting synthesis projects and conference proposals related to DBER focused on undergraduate or graduate STEM education.

For information on how to develop a strong ECR proposal, please refer to the guidance in the ECR program solicitation, [NSF 19-508](#). Note that the ECR program places emphasis on the rigorous development of theory, and therefore proposers must clearly articulate theoretical underpinnings and how the proposed research would advance fundamental knowledge of STEM education at the undergraduate or graduate level.

The deadline for submission of proposals to [NSF 19-508](#) is October 3, 2019, and the first Thursday in October annually thereafter. When responding to this DCL, please begin your proposal title with "ECR DBER DCL: ". Submissions should follow the [NSF Proposal & Award Policies & Procedures Guide \(PAPPG\)](#) and the guidelines in ECR solicitation [NSF 19-508](#).

Principal investigators with questions pertaining to this DCL may contact:

- STEM Learning & Learning Environments: Dawn Rickey, Program Director, drickey@nsf.gov
- Broadening Participation in STEM: Jessie Dearo, Program Director, jdearo@nsf.gov
- STEM Workforce Development: Earnestine Easter, Program Director, eeaster@nsf.gov

Sincerely,

Karen Marrongelle
Assistant Director, EHR

References

[1] National Research Council. 2012. *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering*. Washington, DC: The

National Academies Press. <https://doi.org/10.17226/13362>.

[2] National Academies of Sciences, Engineering, and Medicine. 2018. *Graduate STEM Education for the 21st Century*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25038>.