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## Dear Colleague Letter: Research on STEM Learning in Formal and Informal Settings in CAREER Proposals

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Date: May 24, 2010  
To: Dear Colleagues  
From: David A. Ucko  
Division Director (acting)  
Division of Research on Learning in Formal and Informal Settings

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 careers. The purpose of this letter is to clarify and extend the guidelines included in Program Solicitation NSF 08-557 (<http://www.nsf.gov/pubs/2008/nsf08557/nsf08557.htm>) as they relate to proposals submitted to the Division of Research on Learning in Formal and Informal Settings (DRL).

DRL invests in innovative and potentially transformative research, as well as in projects that address the development and evaluation of learning and teaching across all STEM disciplines, producing cutting-edge knowledge and practices in both formal and informal learning settings. The division seeks to advance theory, practice, method, measurement, development, evaluation, and application. In doing so, it aims to create the ideas, resources, and human capacity to bring about significant changes in STEM education.

A CAREER proposal should be submitted to the DRL program that it most closely fits. The DRL home page (<http://nsf.gov/div/index.jsp?div=DRL>) provides information on the programs accepting CAREER proposals: (a) Research and Evaluation on Education in Science and Engineering (REESE), (b) Discovery Research K-12 (DR K-12), (c) Informal Science Education (ISE), and (d) Innovative Technology Experiences for Students and Teachers (ITEST).

A recent review of CAREER proposals submitted to DRL indicates the need to call potential investigators' attention to the following key features of proposals submitted to this division:

**Scope of Work:** DRL particularly welcomes proposals that (1) advance the frontiers of STEM learning and teaching, and evaluation, and provide the foundational knowledge necessary to improve teaching and learning at any educational level and in any learning setting; (2) develop and study innovative resources, models, and technologies for use by students, teaching professionals, administrators, policy makers, and/or STEM communicators or the general public; (3) develop and study means to increase interest in, engagement with, and understanding of STEM by individuals of any ages and backgrounds in either informal or formal learning contexts; and (4) enhance and study participation in the U.S. workforce in fields involving STEM through the design, implementation, scale-up, and testing of strategies for students and teachers, and research studies that deepen understanding of issues related

to STEM workforce participation.

**Research Design and Methodology:** DRL expects CAREER investigators to propose research methods that are well justified and suited to the research questions being studied, and likely to yield significant knowledge in pursuit of the relevant core problems in STEM education. Proposals 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 information on the reliability, validity, and appropriateness of proposed measures and instruments or specific 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.

In addition, 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 describe substantially integrated research and education plans with the goal of making advances in both domains. Advisory Boards, including experts from the fields represented in a proposal are highly recommended to ensure appropriate advice, oversight, and direction of the proposed scope of work, as well as to evaluate the impact and effectiveness of the research and education activities.

For further information, please contact the following Program Directors:

For REESE:

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