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

Date: October 26, 2011
To: Dear Colleagues
From: John C. Cherniavsky
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 11-690 (http://www.nsf.gov/pubs/2011/nsf11690/nsf11690.htm) as they relate to proposals submitted to the Division of Research on Learning in Formal and Informal Settings (DRL).

DRL invests in projects to enhance Science, Technology, Engineering, and Mathematics (STEM) learning for people of all ages in both formal and informal learning settings. As a division, its role is to be a catalyst for change by advancing theory, methods, measurement, development, evaluation, and application in STEM education. The integration of cutting-edge STEM content and the engagement of scientists, engineers, and educators from the range of disciplines represented at NSF are encouraged in all DRL initiatives. The Division seeks to support both development of promising new ideas and scale-up and sustainability of proven educational innovations.

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 research at the frontiers of STEM learning, education, and evaluation in order to provide foundational knowledge for improving teaching and learning at all educational levels and in all learning settings; (2) enable significant advances in preK-12 learning of STEM disciplines through research and development on innovative resources, models, and technologies for use by students, teachers, administrators, and policy makers; (3) support innovation in lifelong learning through investments in research, development, and infrastructure and capacity building for STEM learning outside formal school settings; and (4) address the growing demand for professional and information-technology workers through the design, implementation, scale-up, and testing of technology-intensive educational experiences for students and teachers, and through related research studies.

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 with 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.
- 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:

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