

Writing Competitive Proposals for Programs in NSF's Division of Research on Learning in Formal and Informal Settings

Ellen McCallie, Chris Hoadley, Michael Ford, National Science Foundation, USA
emccalli@nsf.gov, choadley@nsf.gov, miford@nsf.gov

Abstract: The National Science Foundation supports innovative research, development, and evaluation of learning and teaching across STEM settings. This workshop focuses on understanding the priorities of DRL's programs and provides guidance in writing competitive, high quality proposals. The workshop is structured to include opportunities for collaborative work, discussion, and questions. The content of the workshop includes: 1) STEM educational research in DRL; 2) priorities and changes in DRL's major programs, 3) NSF's proposal review process; and (4) characteristics of competitive and poorly-rated proposals. Both novice and experienced researchers are encouraged join in the discussions and to bring proposal concepts for discussion.

Theoretical Framework

The primary goal of the workshop is to examine the proposal-writing process and NSF's review criteria for researchers interested in submitting proposals to DRL. While the basic structure of NSF and DRL is unchanged from the previous review cycle, most DRL programs and solicitations for proposals have been revised, as are the priorities and emphases of Division administrators. The revisions reflect the changing priorities and the evolving nature of foundational knowledge and practices in STEM education across settings and age groups. Along with new approaches to K-12 science education (NRC, 2012) and undergraduate biology education (AAAS, 2011), there are new standards for what students should know and be able to do (NGSS, 2013). The desired changes in student learning outcomes, instructional practices, and approaches to evaluating progress will require both large-scale studies of educational practices and smaller exploratory studies of new innovations that may have the potential to transform current practices. For long-term success, these efforts must be solidly grounded in sound theoretical frameworks and based on strong evidence of effectiveness.

The National Science Foundation wants to identify and support researchers who will take up these new challenges. In the broader context of Federal support for education research and evaluation, DRL's challenge is to be a catalyst for change in advancing theories, methods, measurements, resource development, and applications in STEM education. The Division seeks to meet this challenge by supporting both early, promising innovations and larger-scale adaptations of educational innovations shown to be effective.

NSF is the premier Federal agency supporting research and development at the frontiers of discovery in the STEM fields, so DRL takes as a central principle that new and emerging areas of STEM must figure prominently in efforts to improve STEM education at all levels and in all settings.

Rationale

The primary rationale is to increase capacity among the communities of STEM education researchers to write competitive and high quality proposals. In this regard, it is important to understand the larger context of NSF goals for scientific research. The NSF context includes: emphasis on potentially transformative research; NSF culture of evolving programs to meet dynamic opportunities; evaluation and accountability expectations; research and development with respect to the *Common Guidelines*; and knowledge and evidence base for change.

Goals

Workshop participants will better understand: DRL's major research programs and priorities; the NSF review process; essential elements of strong proposals; common weaknesses in proposals; and the mechanics of proposal preparation. Presentations will set the context for the priorities of NSF, EHR, and DRL. There will be a brief discussion of NSF's current structure and organization and funding levels. The bulk of the time will be spent on the NSF proposal review process, what makes a proposal competitive, and how DRL thinks about "rigor" in education research. Participants will have multiple opportunities for interaction. This will be accomplished two ways: First, participants will critique and discuss prearranged scenarios that demonstrate proposal strengths or weaknesses highlighted in the presentation, and second, participants will have opportunities to describe and get feedback on their own research ideas.

Structure

The workshop is comprised of multiple segments to vary the format and provide opportunities for interaction. Part 1 (45 min) begins with an introduction to DRL's funding programs: Education Core Research (ECR); Advancing Informal Science Learning (AISL; formerly ISE); Discovery Research K-12 (DRK-12), Promoting Research and Innovation in Methodologies for Evaluation or PRIME, Innovative Technology Experiences for Students and Teachers (ITEST), and Faculty Early Career Development (CAREER).

Facilitators will describe the programs' objectives, topical strands, types of awards, and provide examples of projects supported by each program. The session will then continue with an overview of the NSF review timeline and merit criteria – intellectual merit and broader impact – and DRL-specific expectations and procedures. A brief overview of related programs within the Education and Human Resources Directorate and across the NSF directorates will also be provided. The purpose of this session is for participants to understand the programs' foci and the review process.

In Part 2 (90 min), participants will split into smaller groups. During this time, the participants will first read a scenario – a short passage designed to stimulate discussion about strengths and weaknesses of proposals. The scenarios are likely to include: 1) brief passages that address important proposal elements such as national significance, role of STEM content, connections to theory-building or testing, and rigor and evidence in study design; and 2) brief summaries of potential research projects or study ideas, which Program Directors occasionally receive from potential applicants.

The scenarios will be prepared by Program Directors as exemplars. Passages from real proposals are used, and have been approved through the NSF's Office of the General Counsel's process. This is also an opportunity for participants to discuss their own questions in a smaller and more congenial environment.

Part 3 (45 min) will explore the qualities of successful (and unsuccessful) proposals. This presentation will include discussion of common strengths of highly-rated proposals and typical weaknesses of poorly-rated proposals. It will also include clear examples that will relate directly to the two NSF merit review criteria and to the DRL programs. Practical guidelines for presenting a compelling case for a proposed project will be presented during this portion of the workshop, with suggestions about how to convince reviewers that a proposal is worthy of support. Useful NSF resources, such as the *Grant Proposal Guide* (NSF, 2013) and related guidelines will be described. Participants' questions are encouraged.

The small groups will rejoin for Part 4 (45 minutes). Participants will shift from discussion of pre-arranged scenarios to discussion of their own questions or individual proposal ideas. This format allows participants to bring up questions or points of discussion about the programs or about the review process in a smaller and more congenial environment. To support open dialogue, participants are invited to share a brief summary of a potential research topic or study. As mentioned above, Program Directors commonly receive brief summaries of this type from researchers and are asked to provide feedback on both the selection of the appropriate program and on the potential strengths and weaknesses of the idea. After having read and discussed the scenarios, participants may be more comfortable with their small group to mention their research ideas.