Discovery Research K-12 (DR K-12) Program

Division of Research on Learning in Formal and Informal Settings

Program Solicitation: NSF 13-610
Important Dates

Full Proposals
December 6, 2013

October 16, 2014
Overview of the Session

• Describe the DRK-12 Program & Project Expectations
  ➢ 4 Strands
  ➢ 2 Proposal Types
  ➢ Relationship to Common Evidence Guidelines

• Round 1 of Questions
• Proposal Preparation and Review Process
• Round 2 of Questions
• Further Information and Resources
• Final Questions
Goal of the DR K-12 Program

Enhance STEM learning of teachers and students, preK-12, through research and development of innovative resources, models and tools (RMTs)

- Catalyze new approaches
- Develop students’ 21st century skills
- Provide multiple pathways/resources
DRK-12 Projects

- Build on fundamental research and STEM education development literature and practice
- Have rigorous research and development plans
- Reflect the needs of an increasingly diverse student and teacher population
DRK-12 Projects

• Contribute to knowledge about learning and development

• Large R&D projects are expected to produce RMTs that have been tested and that could be used by others
DRK-12 Research and Development Strands

1. Assessment
2. Learning
3. Teaching
4. Implementation
Assessment Strand: Propose to research and develop assessments of student and teacher practice, concepts, and skills

DRK-12 is particularly interested in assessments that:

• Measure difficult disciplinary, cross-cutting or emerging STEM practices and concepts
• Provide information that can be used to modify instruction
• Use technology in new and innovative ways

Proposals in this strand must have appropriate plans to ensure validity and reliability
Learning Strand: Propose to research and develop RMTs for students

- Help students learn emerging, cross-cutting and important practices and concepts in STEM
- Engage students in meaningful scientific data collection, analysis, visualization, modeling and interpretation
- Use technology in innovative ways
- Are based on sound learning theory and have appropriate developmental designs
Learning Strand: Propose to research and develop RMTS for students

DRK-12 is particularly interested in proposals that

• Focus on new areas of learning not part of the traditional curriculum (i.e. engineering education, computational thinking, systems thinking)

• Effectively engage all students

• Have an explicit role in classrooms
Learning Strand: Proposals may focus on

- RMTs that could be implemented in current educational settings
  - Proposals need to show how this could enhance learning
  - Proposals must demonstrate how the focus is related to important current challenges
- RMTs that challenge current practice and envision a fundamentally different learning environment
Teaching Strand: Propose to research and develop RMTs to help teachers provide high quality STEM education

- Innovative models to recruit, develop, induct, and retain STEM teachers
- Resources for helping pre- and in-service teachers develop content and pedagogical knowledge and skills
- Tools for sharing teaching expertise within schools, districts and states
- Tools to help teachers customize instruction
**Teaching Strand:** Propose to research and develop RMTs to help teachers provide high quality STEM education

- Full proposals must have appropriate research designs that explore the relationships among teacher knowledge, teacher practice and use of the RMT, and student learning.

- Pre-service projects are encouraged but funding cannot be used for tuition for undergraduates.
Implementation Research Strand: Propose to research the factors that contribute to successful high-quality innovations

- Proposals that examine how a community of practice (researchers, developers and practitioners) forms to identify, refine or develop appropriate RMTs
- Proposals that investigate the factors that enhance or impede the implementation of an RMT to determine what works for whom and under what conditions
Implementation Research Strand: Propose to research the factors that contribute to successful high-quality innovations

• Proposals that study the conditions necessary for implementation of RMTs in wider contexts

• Proposals that develop evidence of the efficacy or effectiveness of a previously developed RMT
Types of Proposals

• Exploratory
• Full Design and Development
Exploratory Proposals

• Undertake early research and development of innovative RMTs or substantively revise an existing RMT.
• Establish plausible hypotheses for research and development activities
• Develop appropriate measures for assessing the RMT including ways to determine appropriate levels of technical quality
Exploratory Proposals

- Produce empirical evidence to inform further research and development
- Are consistent with the Early Stages and Exploratory type of research and development in the *Common Guidelines for Educational Research and Development*
Full Design and Development

• Build on promising projects funded by NSF or others where there is evidence of effectiveness from small studies
• Build on solid theories of learning
• Have plans for creating, validating or using existing instruments to assess learning
• Have appropriate research designs and analysis plans to assess learning
Full Design and Development

• Result in useable products that have evidence of feasibility and effectiveness
• Are expected to contribute to theory and lead to peer reviewed publications
• Are consistent with the Design and Development type of research and development in the *Common Guidelines for Educational Research*
Conferences, Workshops, & Syntheses

- Need to be well-focused and related to the goals of DRK-12
- Should generate a product that is useful to those who did not attend the meeting
- Involve a diverse set of attendees
What are the **Common Guidelines**?

- NSF 13-126 - Joint effort between NSF and the Institute for Education Sciences at the U.S. Department of Education
  

- NSF 13-127 - Set of FAQs
  
Goals of the *Common Guidelines* Project

• Improve the quality and pace of findings from education *research and development* proposals

• Develop an education infrastructure that supports more rapid and efficient knowledge development

• Aid NSF and ED in making informed choices about where to invest scarce research and development dollars

• Provide clarity for the field (and within the two agencies)
Types of Studies

• Foundational research and development studies
  ➢ Generate fundamental knowledge that may contribute to teaching and/or learning

• Early stage/exploratory studies
  ➢ Examine relationships among constructs to establish logical connections

• Design and development studies
  ➢ Design and iteratively develop particular interventions (programs, policies, practices or technologies); can also pilot test fully developed intervention to see if it achieves its intended outcomes
Types of Studies - Impact

- **Efficacy research and development**
  - Testing of a strategy or intervention under “ideal” circumstances, including with a higher level of support or developer involvement than would be the case under normal circumstances

- **Effectiveness research and development**
  - Effectiveness of a strategy or intervention under circumstances that would typically prevail

- **Scale-up studies**
  - Effectiveness in a wide range of populations, contexts, and circumstances, without substantial developer involvement in implementation or evaluation.
Example: Design & Development - Purpose

Develop new or improved interventions or strategies to achieve well-specified learning goals or objectives

- Development of a solution
- Creation of measures to assess implementation of the solution
- Collection of data on the feasibility of implementation
- Conduct a pilot study to examine promise
Design & Development - Justification

• Policy and/or practical significance
  ➢ Proposal should provide a compelling rationale

• Theoretical and Empirical Basis
  ➢ Strong justification for development
  ➢ Description of the initial concept for the planned investigation
Design & Development - Evidence

• Project Outcomes
  ➢ Fully developed version of RMT
  ➢ Well-specified theory of action
  ➢ Descriptions of major design iterations
  ➢ Empirical evidence of adjustments made
  ➢ Measures with evidence of technical quality
  ➢ Pilot data on promise
Design & Development - Evidence

• Research Plan – methods for
  ➢ Development of intervention
  ➢ Collecting evidence on feasibility of implementation
  ➢ Obtaining pilot data on the promise of the intervention for achieving the expected outcomes
Common Guidelines for Educational Research and Development

• Potential PIs and grant writers are encouraged to use the information in the *Common Guidelines for Educational Research and Development* and the set of NSF FAQs regarding them to help in the preparation of proposals.
Questions
Proposal Preparation
Proposal Preparation

• **DR K-12 Solicitation: NSF 13-601**
  (Section V. Proposal Preparation and Submission Instructions)

• Proposals must be prepared in accordance with the **NSF Grant Proposal Guide (GPG 13-1)**
Project Summary

• **First Sentence**
  • Type of Proposal – exploratory, full R&D, conference/workshops
  • Main strand addressed

• **Second Sentence**
  • STEM Discipline(s)
  • Grade or Age level(s) addressed

• **Intellectual Merit and Broader Impacts**
  • Must include separate statements on each of these two NSB criteria
Goals and Purposes

• Why is this project important?
• How will the project improve STEM education?
• How will it advance knowledge?
• What are the anticipated outcomes and/or products of this project?
• How might these products or findings be useful on a broader scale?
What Have You and Others Done?

• Describe the theoretical and research basis on which the proposal is based

• Discuss how the proposal is innovative and different from similar research and development projects

• If you have been funded by NSF, provide evidence about the effectiveness and impact of that work
How Are You Going To Do It?

• State clear research questions or hypotheses that the project will test
• Describe the plan for developing, adapting or implementing the proposed innovative resource, model, or tool
• Describe the research methods, including data analysis plans, sampling plan, and assessments
• Briefly describe the work plan and timeline
Who Will do The Work?

• Briefly describe the expertise of the persons included in the proposal and why they are needed:
  - Educational researchers and evaluators
  - Teachers
  - STEM content experts

• Upload two page bios for all senior personnel
Evaluation or External Review

A proposal must describe appropriate project-specific external review and feedback processes.

- The review might include an external review panel or advisory board or a third-party evaluator
- The review must independent and rigorous
- The proposal must
  - Describe the expertise of the external reviewer(s)
  - Explain how that expertise relates to the goals and objectives of the proposal
  - Specify how the PI will report and use results of the project's external, critical review process
- There can be different groups providing formative and summative evaluation
Research vs Evaluation

• Research is integral to the project
• Research is conducted by appropriate team members
• Research aims to contribute to theory and to what is known about practice
How Will Others Learn About The Project?

• Plan and specific strategies for **Dissemination** of products and/or findings to researchers, policy makers, and practitioners

• Requirement to share design, findings, and products with the DR K-12 Resource Network, CADRE
Supplementary Documents

- Brief letters of commitment or cooperation*
- List of personnel on the proposal
- Data Management Plan
- Post Doc Mentoring Plan
- NO OTHER DOCUMENTS

*be careful not to include attachments to the letters
Budget

• Should be consistent with level of work – you do not have to request the maximum!
• Two months salary: No more than two months of salary for senior personnel with academic positions on all NSF grants unless justified
• Indirect cost rates: Set by the institution and auditors and is non-negotiable
• No cost sharing
• Limited equipment; no undergraduate tuition
Reasons for Return Without Review

• Violation of formatting rules of the Grant Proposal Guide (e.g. font, page length etc)
• Failure to address specifically intellectual merit and broader impact in the project summary and description
• Unauthorized documents/data in the appendix or supplementary document section
• No post doc plan if post docs are included on budget
• No data management plan
Proposal Review Process

• Proposals are reviewed in panels composed of a range of external experts (e.g. educational researchers, content experts, teachers, developers)

• Each proposal will have about 4 reviews

• Each reviewer rates each proposal as Excellent, Very Good, Good, Fair or Poor
Proposal Review Process

• Proposals with an average score of Good or better, or that have a Very Good or Excellent rating are discussed in a panel.

  ➢ The panel writes a summary of the reviews and ranks the proposal as highly competitive, competitive or non-competitive.

• All elements of the review are advisory to NSF
Review Criteria

All proposals are reviewed under two criteria: Intellectual Merit and Broader Impact:

• What is the potential for the proposed activity to:
  ➢ advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
  ➢ benefit society or advance desired societal outcomes (Broader Impacts)?

• To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?

• Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?

• How well qualified is the individual, team, or institution to conduct the proposed activities?

• Are there adequate resources available to the PI (either at the home institution or through collaborations) to carry out the proposed activities?
January 2013 Proposals

- Proposals to panels: about 450
- Funded: about 60
Number of Awards (2014)

Anticipated number of awards: 35 to 50
Anticipated funds: $50,000,000 for new awards

- Exploratory projects – (15-20 awards)
  - up to $450,000, max 3 years
- Full D&D projects (15-20 awards)
  - up to $3,000,000, max 4 years
- Conferences, Workshops, synthesis – (5-10) awards
  - up to $100,000, max 2 years
Questions
For Further Information

- Call 703-292-8620
- Email: DRLDRK12@nsf.gov
- Contact a DR K-12 Program Director
Program Directors

• The emails and phone numbers of DR K-12 PDs are listed in the announcement.
• Please write to one at a time.
• The following list will help you select which PD might be most related to your topic or area of interest.
• A PD might refer you to someone else after talking with you.
Content Expertise

• **Mathematics Education**: Karen King, Ferdinand Rivera

• **Science Education — Physical, Chemical**: Gerhard Salinger, Maria Oliver-Hoya, Joe Reed

• **Science Education — Biology**: Julia Clark, David Campbell, David Haury, Julio Lopez-Ferrao

• **Engineering and Technology Education**: Gerhard Salinger, Edith Gummer

• **CyberLearning**: Elizabeth VanderPutten, Janet Kolodner, John Cherniavsky

• **Environmental/Climate/Social Science**: Dave Campbell, Elizabeth VanderPutten
**Strands**

- **Assessment** Edith Gummer, Julio Lopez-Ferrao, Karen King, Elizabeth VanderPutten
- **Learning** All DRK-12 Program Directors
- **Teaching** All DRK-12 Program Directors
- **Implementation** Edith Gummer, Andres Henriquez, Elizabeth VanderPutten, Karen King
In 2013-14, CADRE will:

• Provide opportunities for project staff to learn more about research, evaluation, development, and specific areas of STEM;

• Assist in disseminating the DR K-12 projects’ results within the program and throughout the STEM education community through webinars, the CADRE website, project Spotlights, newsletters, workshops, Facebook, Twitter (@cadrek12), and other outreach efforts;

• Support early career researchers and developers through the CADRE Fellowship program; and

• Conduct research and syntheses of the work within the portfolio.
CADRE Resources

• **Project Smart Search:**
  Find DR K-12 funded projects that match your interests at
  [http://cadrek12.org/project-smart-search](http://cadrek12.org/project-smart-search)

• **DR K-12 Portfolio Overview:**
  Read the descriptive overview of the DR K-12 portfolio to learn more about
  the DR K-12 projects funded over the past 5 years, at
CADRE Resources

• CADRE Toolkit:

CADRE has created a toolkit of resources that provides information on the research that is currently funded and includes a variety of measurement instruments; strategies for effective partnering, dissemination, evaluation, and knowledge use; and results of selected targeted studies.

Examples:

Compendium of Research Instruments for STEM Education, PART I: Teacher Practices, PCK, and Content Knowledge

Compendium of STEM Student Instruments PART II: Measuring Students’ Content Knowledge, Reasoning Skills, and Psychological Attributes

Evaluation in DR K-12 Projects: Options
Thank you for your time and attention!