



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

http://www.nsf.gov/pubs/2013/nsf13126/nsf13126.pdf?WT.mc_id=USNSF_124

- NSF 13-127 - Set of FAQs

<http://www.nsf.gov/pubs/2013/nsf13127/nsf13127.pdf>

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



NSF

Questions



NSF



NSF



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



NSF

Questions



NSF



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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

About CADRE

CADRE is the resource network for the DR K-12 Program.

<http://cadrek12.org>; cadre@edc.org

<http://facebook.com/cadrek12>; <http://twitter.com/cadrek12>

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>

The screenshot displays the 'Project Smart Search' interface. At the top, it indicates '294 matching projects' and is powered by 'SEARCH LIKE ME'. Below this is a grid of project cards, each featuring a logo and a title. One card is highlighted with a yellow background and a '41% match' label. Below the grid is a 'Keywords' section with a tree view showing categories like 'research type' and 'age/grade level'. To the right of the keywords is a horizontal slider filter for 'project focus.category: content area', with values for 'assessment' (100), 'science' (25), and 'mathematics' (50). The slider ranges from 'cold' to 'hot'.

- **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

http://cadrek12.org/sites/default/files/CADRE%20YR%205%20Portfolio%20Overview%20v7_stl.pdf



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!**

