Discovery Research preK-12 (DRK-12) Program

Division of Research on Learning in Formal and Informal Settings

Program Solicitation: NSF 17-584

CADRE, the resource network for the DRK-12 Program

CADRE strengthens the capacity, advances the research, and amplifies the influence of DRK–12 projects and researchers, and the DRK–12 program.

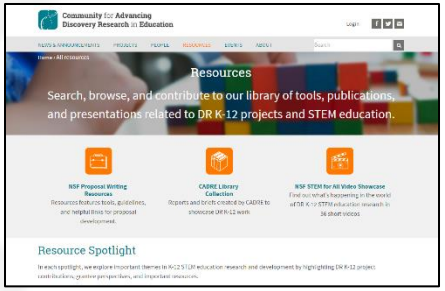
http://cadrek12.org | cadre@edc.org

http://facebook.com/cadrek12

http://twitter.com/cadrek12

Community for Advancing Discovery Research in Education

Resources @ cadrek12.org



- **NSF Proposal Toolkit** includes tools, guidelines, and helpful links for proposal development.
  http://cadrek12.org/resources/nsf-proposal-writing-resources
- **CADRE Library** provides information, tools, and reports for and about DRK-12 projects (e.g., a compendium of measurement instruments; strategies for effective partnering)
  http://cadrek12.org/cadre-sponsored-products-tools
- **Resource Spotlights** highlight DRK-12 project contributions, grantee perspectives, short videos on DRK-12 project work, and important resources within STEM themes.
  http://cadrek12.org/resources

Community for Advancing Discovery Research in Education

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Important Dates

Full Proposals Due
November 14, 2017

Future deadlines:

- November 14, 2018
- Second Wednesday in November, Annually Thereafter

Overview of the Session

- Describe the DRK-12 Program & Project Expectations
  - 3 Strands
  - 6 Proposal Types
- Round 1 of Questions
- Proposal Preparation and Review Process
- Round 2 of Questions
- Further Information and Resources
- Final Questions

Goal of the DRK-12 Program

Catalyze research and development of (STEM) education innovations or approaches that can serve as models for use by the nation's formal STEM education infrastructure (e.g., schools, districts, states, teachers).

The Intent of the DRK-12 Program

1. Catalyze new approaches to STEM learning, teaching, and assessment
2. Build understanding about developing students' 21st century STEM skills
3. Provide multiple pathways and resources in a variety of learning environments to study the learning process itself

DRK-12 Projects

- Contribute to the research base in STEM education
  - 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

- Are expected to result in
  - peer-reviewed research and practice publications
  - innovations or approaches that could be used by others

DRK-12 Research and Development Strands

1. Assessment
2. Learning
3. Teaching

Assessment Strand: Propose to research and develop innovations or new approaches to (1) assessment of STEM learning that generates evidence of participants' knowledge or understanding, or (2) assessment for STEM learning that is an integrated part of the ongoing learning process.

Assessment Strand:

- Integrate development with the investigation of validity through field-testing new forms of assessment, including technology-enhanced assessments.
- Specify the STEM constructs and those who are being assessed (students, teachers, etc.), and which stakeholders the assessment results can validly inform.
- Address the potential benefits and weaknesses of the chosen strategy or strategies, including a careful articulation in the context of the system of learning, instruction and assessment under study.
- Address the role the proposed research and development effort plays in furthering an aligned system of assessment, learning and teaching.

Learning Strand: Propose to research and develop innovations or approaches that assist preK-12 students in accessing and understanding new data sources and discoveries while leveraging their potential to support learning of important STEM content in the classroom.

- Consider the ways in which STEM innovations or approaches could be designed and implemented in a range of learning environments that enhance student learning.
- Research and develop STEM education innovations or approaches to student learning that can be implemented in current classrooms, schools, and other learning environments for preK-12 students.

Learning Strand continued:

- Describe how the proposed STEM education innovation or approach aligns with current curriculum frameworks and demonstrate how it would be an improvement relative to current practice.
- Provide a compelling argument for why the innovation or approach would lead to improved student learning outcomes.
- Demonstrate the potential to significantly enhance outcomes for student learning.

Teaching Strand: Propose to research and develop STEM education innovations and approaches to help teachers provide high quality STEM education

- Improve instructional practices aimed at increasing STEM students' learning and outcomes.
- Recruit, certify, induct, and retain STEM teachers.
- Help pre- and in-service teachers develop STEM content and pedagogical content knowledge to improve instructional practice.

Teaching Strand: Propose to research and develop STEM education innovations or approaches to teacher pre- and in-service education

- Support career-long learning by preK-12 teachers with the potential for effective implementation, successful diffusion, and future scaling.
- Describe how the proposed STEM education innovation or approach aligns with current frameworks and demonstrate how it would be an improvement relative to current practice.
- Provide a compelling argument for why the innovation or approach would lead to improved teaching outcomes and practice.

Types of Studies

- Exploratory
- Design and Development
  - Early Stage
  - Late Stage
- Impact
- Implementation and Improvement
- Syntheses and Conferences
- DRK-12 Resource Center

Exploratory Proposals

- Provide investigators with opportunities to investigate approaches to STEM education problems that establish the basis for design and development of STEM education innovations or approaches.
- Allow researchers to establish initial connections to or among the outcomes of interest related to STEM assessment, learning or teaching.

Exploratory Proposals must include:

- evidence of the factors associated with STEM education or learning outcomes, including potentially moderating or mediating factors, to establish the basis for design and development of STEM education innovations or approaches;
- a well-specified, empirically supported, conceptual framework or theory of action; and,
- a basis, derived from the empirical evidence, for pursuing a Design and Development, Impact, or Implementation and Improvement Study, or the need for further research.

Design and Development

- Research and develop new or improved STEM education innovations or approaches to achieve specific goals related to assessment, learning, or teaching.
- Build on evidence from prior research and development studies

Early Stage Design and Development

- Research and develop a proof of concept that one can develop STEM education innovations or approaches based on a well-specified theory of action.
- Goals must include providing:
  - a prototype or early version of the proposed STEM education innovation or approach;
  - a clearly articulated theory of action that describes the innovation or approaches assumptions, central design features, anticipated effects these features elicit; and,
  - explanations that relate features to effects.
    - Anticipated effects can include specific learning outcomes, but may also include mediating aspects of learning environments such as patterns of discourse or participation

Late Stage Design and Development

- Begin with STEM education innovations or approaches that have already demonstrated promise in small sets of classrooms, schools, or other learning settings.
- Goals of Late Stage Design and Development must include providing:
  - fully developed STEM education innovations or approaches that have evidence of feasibility and utility for practice;
  - completed products, ready for implementation by others who request them; and,
  - evidence of promise from field studies.

Impact Studies

- Expand the evidence of promise from previous studies to provide more rigorous evidence of the strength of the STEM education innovation or approach to achieve its intended outcomes through efficacy (ideal conditions) or effectiveness (normal conditions) studies.
- Proposals for Impact Studies should provide:
  - clear description of the STEM education innovation or approach to be tested and a compelling rationale for examining its impact including:
    - the problem the STEM education innovation or approach is attempting to address;
    - how the STEM education innovation or approach is an improvement over other approaches to the problem; and,
    - why the STEM education innovation or approach is appropriate and well-suited for an efficacy or effectiveness study.

Outcomes of Impact Studies must include:

- reliable estimates of the average impact of the STEM education innovation or approach through reporting that is consistent with expectations of making causal claims; and,
- plans for documentation of implementation of both the STEM education innovation or approach and the control or comparison condition in sufficient detail for readers to judge the applicability of the study findings to other contexts.

Outcomes of Impact Studies must include:

- detailed descriptions of:
  - the innovation or approach to be implemented, data collection measures to be employed;
  - the study samples involved;
  - plans to account for multi-level or nested data structures in the sampling and analysis plans; and,
  - adequate justifications for the sample sizes proposed.

Implementation and Improvement Studies

- Aim to strengthen the capacity of an organization to reliably produce valued STEM education outcomes for diverse groups of students, educated by different teachers from varied organizational contexts.
- Seek to:
  - study implementation in the local context;
  - employ rapid changes in implementation with short-cycle methods;
  - capitalize on variation in educational contexts to address the sources of variability in outcomes to understand what works, for whom, and under what conditions;
  - address organizational structures and processes and their relation to innovation;
  - employ measurement of change ideas, key drivers, and outcomes to continuously test working theories and to learn whether specific changes actually produce improvement; and,
  - reform the system in which the approach is being implemented as opposed to overlaying a specific approach on an existing system.

Goals of Implementation and Improvement Studies must include providing:

- strategies for improvement or implementation that address the shared goal of the researcher/practitioner collaborators;
- conceptual frameworks that address issues of scale, human capacity, and technical support for implementation and improvement in educational systems;
- measures of organizational learning that assess the progress of implementation and improvement;
- sustainable communities that can support implementation and improvement in the targeted educational system; and,
- documented practices with an ongoing forum for continued engagement of collaborators from various levels of the educational system.

Syntheses

- Synthesis proposals should:
  - focus on a question, issue, or topic of critical importance to the DRK-12 program;
  - demonstrate a command of the literature on the question, issue, or topic, both breadth and depth;
  - make a case for the amount, type, and relevance of available literature to conduct the synthesis; and,
  - discuss literature selection processes (methods, search criteria, etc.) and quality and inclusion criteria (peer review, conference work, reports, evaluations, other).

Conferences

- Conference proposals should:
  - discuss participant expertise and selection;
  - demonstrate a command of the literature and/or practice of the question, issue, or topic;
  - include a conceptual framework for the conference, draft agenda, possible participant list, and the outcomes or products that will result;
  - address the need for the work, why it is timely, and the expected contributions to understanding or advancing the question, issue, or topic; and,
  - generate a product usable by researchers and/or practitioners and indicate how these product(s) serve the DRK-12 program priorities described earlier in this document.

DRK-12 Resource Center

- The primary goal of the Resource Center is to advance research and development activities that have the potential to improve the rigor and quality of research in STEM education by:
  - promoting innovations in STEM teaching and learning,
  - knowledge building and dissemination; and,
  - networking within the STEM education research community.

DRK-12 Resource Center

- Lead institution:
  - a service-oriented educational organization or institution with demonstrated capacity to plan, develop, and manage a national center knowledge building and dissemination
  - have demonstrated expertise in targeting STEM disciplines, rigorous education research methodologies including measurement, and STEM teacher PD
- Capacity Building:
  - facilitate discussions and professional connections across the network of DRK-12 projects through PI convenings, topically-focused meetings, webinars, and other appropriate means
  - collaborate with other resource centers

DRK-12 Resource Center

- Broadening Participation:
  - facilitate broadening participation in STEM education through expansion of the DRK-12 portfolio by targeting outreach and capacity building activities
- Technical Support:
  - monitor DRK-12 projects during the various stages of project implementation and provide technical research assistance appropriate to projects is also expected to collaborate with other resource centers
- Dissemination:
  - facilitate the broad dissemination of project outcomes, findings, and evidence of promising practices to the various STEM education communities

Questions

Funding Levels

- Normal limits for funding requests of DRK-12 proposals are as follows:
  - Level I projects up to $450,000 with duration up to 3 years;
  - Level II projects up to $3,000,000 with duration up to 4 years; and
  - Level III projects up to $5,000,000 with duration up to 5 years.

  - Synthesis proposals up to $300,000 with a duration up to 2 years
  - Conference proposals up to $100,000 with a duration up to 1 year duration
  - Resource Network up to $3,000,000 with a duration up to 3 years

Funding Levels

- The three levels of funding should align with the maturity of the proposed work, the size and scope of the empirical effort, as well as the capacity of the interdisciplinary team to conduct the proposed research.

PROPOSAL PREPARATION

Proposal Preparation

- **DRK-12 Solicitation: NSF 17-584**
  (Section V. Proposal Preparation and Submission Instructions)
- Proposals must be prepared in accordance with the **NSF Grant Proposal Guide (nsf17001)**

Project Summary

- **First Sentence**
  - Type of Study- Exploratory, Early Stage Design and Development, Late Stage Design and Development, Impact, Implementation and Improvement, Conferences & Syntheses, Resource Network
  - Main strand addressed – Assessment, Learning, Teaching
- **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 **intellectual merit** and **broader impacts** 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 innovation.
- Describe the research methods, including data analysis plans, sampling plan, and assessments or measures.
- 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.
- Upload two page bios for all senior personnel.

Mechanisms to Assess Success

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 external critical review should be sufficiently independent and rigorous to influence the project's activities and improve the quality of its findings.
- Successful proposals will:
  - describe the expertise of the external reviewer(s);
  - explain how that expertise relates to the goals and objectives of the proposal; and,
  - specify how the PI will report and use results of the project's external, critical review process.

How Will Others Learn About The Project?

- Plan specific strategies for **Dissemination** of products and/or findings to researchers, policy makers, and practitioners.
- Share design, findings, and products with the DRK-12 Resource Network.

Supplementary Documents

- Brief letters of collaboration*
- 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

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

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

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 Impacts:

- 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?

December 2016 Proposals (FY17 awards)

- Proposals to panels: about 500
- Funded: 50

Number of Awards (FY 2018)

Anticipated number of awards: 20-31

Anticipated funds:

- 8-13 Level I awards
- 5-8 Level II awards
- 1-4 Level III awards
- 5 Conference/Synthesis awards

  will be made in FY 2017, pending availability of funds.
- 1 Resource Center

Questions

For Further Information

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

Program Directors

- The emails and phone numbers of DRK-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.

Areas of Expertise

- **Mathematics Education**: Karen King, Margret Hjalmarson, Bob Ronau, Finbarr Sloane, Ferdinand Rivera
- **Science Education – Physical, Chemical:** Joe Reed, Ann Rivet
- **Science Education – Biology**: Julia Clark, David Campbell, David Haury, Julio Lopez-Ferrao, Robert Russell, Rob Ochsendorf
- **Engineering, Maker, and Technology Education**: Margret Hjalmarson, Joan Walker, Robert Russell
- **CyberLearning:** Amy Baylor, Chia Shen, Robert Russell
- **Environmental/Climate/Social Science**: Dave Campbell, Michael Ford, David Haury
- **Disability:** Rob Ochsendorf
- **Early Childhood:** Catherine Eberbach
- **Teacher Education:** Joan Walker

Good Luck!

& thank you for attending this webinar.

A link to the slides and a recording of this webinar will be sent to registered participants and available on the CADRE website: http://cadrek12.org

Send your feedback to cadrek12@edc.org.

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