

Discovery Research K-12 (DRK-12)

PROGRAM SOLICITATION

NSF 13-601

REPLACES DOCUMENT(S):

NSF 11-588



National Science Foundation

Directorate for Education & Human Resources
Research on Learning in Formal and Informal Settings

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

December 06, 2013

October 16, 2014

IMPORTANT INFORMATION AND REVISION NOTES

Revision Summary

This solicitation has been revised to incorporate into the Other Information section a newly issued publication jointly developed by the National Science Foundation and the Institute of Education Sciences in the U.S. Department of Education entitled, *Common Guidelines for Education Research and Development*. The *Guidelines* describe six types of research studies that can generate evidence about how to increase student learning. Research types include those that generate the most fundamental understandings related to education and learning; examinations of associations between variables; iterative design and testing of strategies or interventions; and assessments of the impact of a fully-developed intervention on an education outcome. For each research type, there is a description of the purpose and the expected empirical and/or theoretical justifications, types of project outcomes, and quality of evidence.

The *Guidelines* publication can be found on the NSF website with the number NSF 13-126 (<http://www.nsf.gov/pubs/2013/nsf13126/nsf13126.pdf>). A set of FAQs regarding the *Guidelines* are available with the number NSF 13-127 (<http://www.nsf.gov/pubs/2013/nsf13127/nsf13127.pdf>). Grant proposal writers and PIs are encouraged to familiarize themselves with both documents and use the information therein to help in the preparation of proposals to NSF.

Revisions to this Solicitation:

1. Describes how the DRK-12 program complements the new EHR Core Research (ECR) program.
2. Replaces the Scale-up strand with an Implementation Research strand.
3. Enhances the description of what is meant by Exploratory and Full Design and Development proposals and emphasizes that the research and development plans are integral to the project.
4. Revises the description of what is required for evaluation of proposals.
5. Eliminates the requirement for Letters of Intent.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised NSF Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 15-1), which is effective for proposals submitted, or due, on or after December 26, 2014. The PAPPG is consistent with, and, implements the new Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance) (2 CFR § 200).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Discovery Research K-12 (DRK-12)

Synopsis of Program:

The Discovery Research K-12 program (DRK-12) seeks to significantly enhance the learning and teaching of science, technology, engineering and mathematics (STEM) by pre-K-12 students and teachers, through research and development of innovative resources, models and tools (RMTs). Projects in the DRK-12 program build on fundamental research in STEM education and prior research and development efforts that provide theoretical and empirical justification for proposed projects. Teachers and students who participate in DRK-12 studies are expected to enhance their understanding and use of STEM content, practices and skills.

DRK-12 invites proposals that address immediate challenges that are facing pre-K-12 STEM education as well as those that anticipate radically different structures and functions of pre-K 12 teaching and learning. The DRK-12 program has four major research and development strands: (1) Assessment; (2) Learning; (3) Teaching; and (4)

Implementation Research. The program recognizes that there is some overlap among the strands. Proposals may address more than one strand. For example, projects in the Learning Strand may also include assessments of student learning, and/or support for teachers and plans for larger dissemination and use. Likewise, the Teaching Strand has a specific focus on RMTs for teacher education and professional development, but these are often based on a particular curriculum or set of instructional materials or tools. The Implementation Research strand that replaces the Scale-up strand in the previous solicitation might potentially address any or a combination of the other three strands. The program supports three types of projects: (1) Exploratory, (2) Full Design and Development, and (3) Conferences, Workshops, and Syntheses. All three types of projects apply to each of the four DRK-12 strands.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- Inquiries can be made to, telephone: (703)292-8620, email: DRLDRK12@nsf.gov
- David Campbell, telephone: (703) 292-5093, email: dcampbel@nsf.gov
- Julia Clark, telephone: (703) 292-5119, email: jlark@nsf.gov
- Michael Ford, telephone: (703) 292-5153, email: miford@nsf.gov
- David L. Haury, telephone: (703) 292-5102, email: dhaury@nsf.gov
- Margret Hjalmarson, telephone: (703) 292-4313, email: mhjalmar@nsf.gov
- Karen King, telephone: (703) 292-5124, email: kking@nsf.gov
- Rebecca Kruse, telephone: (703) 292-4211, email: rkruse@nsf.gov
- Julio Lopez-Ferrao, telephone: (703) 292-5183, email: jlopezfe@nsf.gov
- Helen T. Martin, telephone: (703)292-8620, email: htmartin@nsf.gov
- Joseph Reed, telephone: (703) 292-5187, email: jreed@nsf.gov
- Ferdinand Rivera, telephone: (703) 292-4960, email: frivera@nsf.gov
- Robert Russell, telephone: (703) 292-2995, email: rrussel@nsf.gov
- Elizabeth VanderPutten, telephone: (703) 292-5147, email: evanderp@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.076 --- Education and Human Resources

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 35 to 45 per year. It is anticipated that about 15-20 Exploratory awards, 15-20 Full Research and Development awards, and 5 Conference/Workshop/Synthesis awards will be made in FY 2014, pending availability of funds.

Anticipated Funding Amount: \$50,000,000

Pending availability of funds, NSF anticipates having approximately \$100,000,000 available over the two fiscal year period FY2014-2015 for support of the DRK-12 portfolio. Approximately \$50,000,000 will be available for the FY2014 competition and approximately \$50,000,000 will be available for the FY2015 competition.

Normal limits for funding requests of DRK-12 proposals are as follows: (1) Exploratory projects up to \$450,000 with duration up to three years; (2) Full Design and Development projects up to \$3,000,000 with duration up to four years; and (3) Conference/Workshop/Synthesis projects up to \$100,000 for duration up to two years.

Eligibility Information

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI:

There are no restrictions or limits.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**
 - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
 - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide).

B. Budgetary Information

- **Cost Sharing Requirements:** Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):
 - December 06, 2013
 - October 16, 2014

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria apply.

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Additional reporting requirements apply. Please see the full text of this solicitation for further information.

TABLE OF CONTENTS

Summary of Program Requirements

- I. **Introduction**
- II. **Program Description**
- III. **Award Information**
- IV. **Eligibility Information**
- V. **Proposal Preparation and Submission Instructions**
 - A. Proposal Preparation Instructions
 - B. Budgetary Information
 - C. Due Dates
 - D. FastLane/Grants.gov Requirements
- VI. **NSF Proposal Processing and Review Procedures**
 - A. Merit Review Principles and Criteria
 - B. Review and Selection Process
- VII. **Award Administration Information**
 - A. Notification of the Award
 - B. Award Conditions
 - C. Reporting Requirements
- VIII. **Agency Contacts**
- IX. **Other Information**

I. INTRODUCTION

About the National Science Foundation and the Directorate for Education and Human Resources

The National Science Foundation (NSF) is charged with promoting the vitality of the nation's science and engineering research and education enterprises.

The Directorate for Education and Human Resources (EHR) makes investments that support a healthy and vital national science, technology, engineering, and mathematics (STEM) education enterprise. The directorate works toward that vision through its mission, which is to support the preparation of a diverse, globally competent STEM workforce and a STEM-literate citizenry through investment in innovative research and development on STEM education and learning.

Opportunities to learn STEM effectively - for people of all ages, from all corners of the Nation, and in many venues (e.g., classrooms and living rooms; science centers and virtual centers) - are the foundation for a scientifically literate society and strong scientific workforce. These in turn are the basis for keeping our Nation globally competitive, prosperous and secure. EHR provides the focus for NSF's investments to advance STEM learning, scientific literacy, and a globally competitive science and engineering workforce.

The EHR investments are concentrated into three categories that form a strategic framework for the directorate's mission. Within each of these categories, EHR will continue to build and emphasize its research and development activities.

- Learning and learning environments: Investments in this category seek to develop understanding of the cognitive, affective, and non-cognitive foundations of STEM learning; to study emerging contexts and tools for learning STEM concepts and skills; and to build environments that promote new, high-impact learning opportunities for tomorrow's scientists and engineers, as well as citizens and students living in an increasingly technology-oriented society.
- Broadening participation in STEM: Programs in this category capitalize on the Nation's diversity in order to increase the scientific workforce by engaging and building capacity in *all* people in STEM learning and professional training, particularly those from groups that have been traditionally underrepresented in STEM fields.
- STEM workforce: Workforce investments are intended to improve the education and preparation of a STEM workforce that will be ready to capitalize on unprecedented advances in technology and science, and to address global, social, and economic challenges yet to be imagined.

This framework positions the directorate to respond more readily to emerging opportunities created by new technologies, improvements in the STEM education evidence base, administration priorities, and other national or societal needs. Different programs within EHR emphasize different categories of the research and development activities (http://www.nsf.gov/about/budget/fy2014/pdf/25_fy2014.pdf).

To achieve these goals, the Directorate sponsors programs in the Division of Research on Learning in Formal and Informal Settings (DRL), Division of Undergraduate Education (DUE), Division of Graduate Education (DGE), and Human Resource Development (HRD). The DRK-12 program is managed in DRL.

About the Division of Research on Learning in Formal and Informal Settings

The Division of Research on Learning in Formal and Informal Settings (DRL) supports the research and development of innovative resources, models, and tools for K-12 STEM education and teacher learning; research and development within partnerships of K-12 school districts and institutions of higher education; fundamental research on STEM learning; research and development of experiences that enable lifelong STEM learning inside and outside of school; research on national STEM education priorities; and evaluation studies and activities. While DRL-funded research is likely to be situated in institutional and social settings and may involve development of learning resources, tools, and model learning environments, the principal goal is to understand and support STEM learning in all its forms, by the full range of learners, in a full range of settings. This includes development of innovative and effective approaches and instruments for promoting and assessing learning. A particular focus is on understanding how to improve STEM learning and education opportunities for all learners, including those from groups traditionally underrepresented in STEM - especially women, minorities, persons with disabilities, English-language learners, and veterans. DRL encourages the submission of EAGER, RAPID, and CAREER proposals in its programs.

DRL funds projects through the following programs:

- Advancing Informal STEM Learning (AISL)
- Discovery Research K-12 (DRK-12)
- Innovative Technology Experiences for Students and Teachers (ITEST)
- Math and Science Partnership (MSP)
- Promoting Research and Innovation in Methodologies for Evaluation (PRIME)
- Research on Education and Learning (REAL)

Each program can be accessed from [the DRL Web Page](#)

II. PROGRAM DESCRIPTION

The Discovery Research K-12 program (DRK-12) seeks to significantly enhance the learning and teaching of science, technology, engineering and mathematics (STEM) by preK-12 students and teachers, through research and development of innovative resources, models and tools (RMTs). The intent of the DRK-12 program is to: (1) catalyze new approaches to STEM learning; (2) develop students' 21st century STEM skills; and (3) provide multiple pathways and resources in a variety of learning environments to study the learning process itself. DRK-12 is committed to attracting and retaining a diverse population of students in STEM fields of study.

Projects in the DRK-12 program build on fundamental research in STEM education and prior research and development efforts that provide theoretical and empirical justification for proposed projects. Teachers and students who participate in DRK-12 studies are expected to enhance their understanding and use of STEM content, practices and skills. DRK-12 invites proposals that address immediate challenges that are facing preK-12 STEM education as well as those that anticipate radically different structures and functions of pre-K 12 teaching and learning. The projects funded by DRK-12 reflect the needs of that increasingly diverse population--as well as national, state, or discipline priorities--and contribute to the research base in STEM education by studying how students and teachers learn with innovative RMTs.

For DRK-12 proposals, resources could include a wide variety of research-based materials, information sources, or services that enhance or empower effective teaching and learning. Models provide frameworks for organization, action, or engagement in teaching or learning, or both. Innovative frameworks could focus on a wide range of structures, including ways to: engage students in new content or STEM practices; enrich learning environments; and promote increased teacher knowledge, collaboration, and networking. Tools include a wide range of devices, procedures, and processes that enable students, teachers, administrators, or parents to pursue specific purposes or goals. Tools could include innovative applications of new technologies or media, diagnostic information

about student learning, or instruments to gauge effective teaching.

Outcomes from DRK-12 projects include RMTs that have research-based evidence of their utility, feasibility and potential for wide-spread use, as well as evidence of their contributions to knowledge about STEM learning and teaching. DRK-12 especially encourages proposals that challenge existing assumptions about learning and teaching within or across STEM fields, envision the future needs of learners and teachers, and consider new and innovative ways to support student and teacher learning. Balancing innovation and feasibility in the design of RMTs is a considerable challenge for all researchers and developers supported by DRK-12.

As a research and development program, DRK-12 contributes to knowledge of how innovative and effective RMTs in STEM are developed and tested. The emphasis is on what works, for whom, and under what conditions. The DRK-12 program not only contributes to the development of products that are useable and useful for pre-K12 students and teachers, but also generates new knowledge about the nature of STEM learning and learning environments. Research and development plans are integral to every project description.

DRK-12's contributions to the knowledge base in education differ from the EHR Core Research program (ECR) or from the Research on Education and Learning (REAL) program in that the focus of DRK-12 research is on the translation of foundational and early stage research into the development and implementation of RMTs. DRK-12 differs from the ECR in its focus on the research and development of products and processes that have ultimate use in K-12 schools and pre- and in-service teacher preparation settings. The knowledge base to which DRK-12 contributes is more closely aligned with theories in practice than with foundational theory building.

The DRK-12 program is primarily concerned with the goals and effectiveness of formal education, but recognizes that learning is not limited to formal school environments and normal school schedules. The program encourages proposals to draw from knowledge and practice of learning in out-of-school and informal settings to enhance learning and teaching in formal settings. DRK-12 has a focus on pre-K through the end of high school, but the connection to college and career-ready standards ties the work of many projects to post-secondary education. The standards describe what students should know and do at particular grade levels or grade bands and the conditions of education that support them. DRK-12 proposals may focus on a specific STEM discipline or concept at a specific grade level, or focus on concepts or practices that cut across STEM disciplines and grade levels.

The DRK-12 program has four research and development strands: (1) Assessment; (2) Learning; (3) Teaching; and (4) Implementation Research (described in detail below). DRK-12 recognizes that there is some overlap among the strands. For example, a proposal submitted to the Learning Strand may also include assessments of student learning, and/or support for teachers and plans for larger dissemination and use. Likewise, a proposal submitted to the Teaching Strand might research and develop a model of inservice teacher education, but also include the development or modification of assessments for students. The Implementation Research strand might address any or a combination of the other three strands. Collectively, the four strands foster the creation of a new generation of RMTs that take full advantage of the rich research base on STEM learning, the capabilities of modern technologies to enhance the education of preK-12 learners and teachers, and emerging science and mathematical discoveries.

The DRK-12 program seeks to maintain a balanced portfolio by supporting projects ranging from those with immediate applicability to those that anticipate and provide the foundation for preK-12 STEM education as it could be in future decades. Proposals that anticipate education as it could be in the future (10-20 years) will necessarily put forward ideas, concepts, theories, practices and research and development that challenge existing assumptions about STEM learning and teaching. Such proposals could, for example, offer promise of being dramatically more effective with the diversity of learners that are represented in our nation. Proposals that address immediate and pressing challenges typically develop and study RMTs that could be implemented and used by educators in the relatively near term, albeit in highly innovative ways.

The program supports three types of projects: (1) Exploratory, (2) Full Design and Development, and (3) Conferences, Workshops, and Syntheses. All three types of projects apply to each of the four DRK-12 strands.

Information on current DRK-12 projects can be found at www.cadrek12.org and at [NSF Award Search](#)

DRK-12 Program Strands

All DRK-12 proposals should be well grounded in the findings of STEM education research; be supported by a well-articulated framework that is based on a specific theory of learning and teaching; be guided by a specific research question, set of questions, or hypothesis; use appropriate and rigorous research and development designs; employ appropriate forms of analysis; and generate useful resources, models, or tools.

(1) Assessment Strand:

Numerous reports have highlighted the need for new and more sensitive assessments in a range of areas. These include the emphases of the new college and career readiness standards on new STEM content and practices, emerging science and mathematics concepts, and new technologies.

Proposals in this strand may focus on students or teachers, or both. The focus may be on one grade level or across levels. The content and practice focus may be within a discipline or across disciplines. Proposals should discuss how the project will ensure that the resulting assessments: (1) measure important constructs; (2) are valid and reliable; and (3) are fair and culturally and linguistically sensitive. DRK-12 encourages proposals that develop and study assessments that:

- focus on formative assessments that help teachers provide guidance to students and inform teacher decision-making;
- measure preK-12 students' knowledge of core disciplinary ideas, unifying concepts or affective constructs such as engagement, persistence, values and attitudes toward STEM disciplines;
- evaluate skills and practices that are critical for success in STEM, such as collaboration, modeling, complex problem solving, and design;
- measure learning and other outcomes in ways that are embedded within cyber-enabled learning environments, including virtual environments, on-line classes, simulations and games;
- are instructionally sensitive in that they measure changes in student learning as a result of different types of educational experiences; or
- probe teachers' knowledge of core and emerging STEM content, pedagogical content knowledge and practices.

(2) Learning Strand:

Well-designed and fully tested RMTs are crucial to excellent preK-12 STEM education. Research-based RMTs are needed for effective implementation of the new college- and career-readiness standards that provide students with opportunities to learn recommended concepts and practices. At the same time, new and exciting discoveries are being made in the STEM disciplines. Large amounts of scientific data are now available for use by learners of all ages. RMTs are needed that help preK-12 students

access and understand these information sources and new discoveries. RMTs may also take advantage of the enormous potential of new and emerging technologies. Proposals submitted to this strand address research and development of RMTs that: (1) help students understand new and emerging content in STEM; (2) develop important and cross-cutting concepts and ideas as described in new career- and college-readiness standards; (3) help students learn key STEM concepts, practices, scientific investigation, and engineering design as outlined in standards documents; and (4) effectively engage and serve the diversity of learners found in U.S. classrooms.

DRK-12 seeks proposals that consider ways in which RMTs could be implemented in a range of learning environments that enhance student learning. DRK-12 encourages proposals that develop and study RMTs that:

- can be implemented in current classrooms, schools, and other learning environments for preK-12 students; successful DRK proposals discuss how the RMT aligns with current curriculum frameworks and other requirements, show how it can significantly enhance teaching and student learning of the current standards, practices, and pedagogy, and demonstrate the potential of the RMT to significantly enhance current practices;
- challenge current practices and standards; the proposal may focus on emerging STEM concepts and practices that are outside the scope of existing school curricula and should explain how the RMT(s) are likely to be potentially transformative; or
- dramatically increase broader participation in STEM; these proposals should discuss how their approach is particularly suitable to the target population.

For Full Research and Development projects, proposals should include plans to develop support for teachers, appropriate and technically robust assessments, and other materials to ensure that the RMTs can be used by others and further studied.

(3) Teaching Strand:

Proposals submitted to this strand would focus on research and development of RMTs that help pre- and in-service teachers provide high quality STEM education for all students.

The DRK-12 program recognizes that a well-prepared and well-supported STEM teacher workforce is crucial to excellent preK-12 STEM education. The challenges and opportunities for teachers are enormous. New college and career readiness standards require fundamental changes in practice. At the same time, the STEM disciplines are rapidly changing, making exciting discoveries that need to be incorporated into preK-12 education. Teachers need support to learn about these new discoveries and pedagogical techniques. Technology offers enormous opportunities for teachers to collaborate with others, access and use data for instructional purposes, and provide their students innovative learning tools. The student population is increasingly diverse. Pre- and in-service teachers need support to understand the new standards and to implement them in ways that make learning accessible to all students.

The DRK-12 program seeks proposals to study existing teacher pre- and in-service programs and develop innovative models that support career-long learning by preK-12 teachers and have the potential for successful diffusion and future scaling. Therefore, DRK-12 does not provide scholarships for undergraduate students. DRK-12 encourages proposals that research and develop:

- innovative models to recruit, certify, 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 and districts and across the broader national teacher community;
- tools that provide teachers with dynamic diagnostic information about student learning in real-time; or
- tools that provide teachers with the ability to customize curriculum to meet the needs of diverse student populations.

Full design and development projects in this strand should have appropriate research designs to explore the relationships among teacher learning, teacher support, teacher practice and student learning.

(4) Implementation Research Strand:

Implementation Research in DRK-12 might be conducted from multiple starting points. DRK-12 is interested in proposals that develop evidence of the efficacy and effectiveness of previously developed RMTs that move from being studied in the development environment to operating under more general educational conditions. Some research and development proposals might start with the coalescing of a community of researchers, developers and practitioners around a particular problem of educational practice and iteratively design and test RMTs that address them. Other proposals might study a RMT that is already operating at scale to determine the factors that enhance or impede the implementation of high quality education. Accordingly, the DRK-12 program supports Implementation Research at all stages of the research and development process.

There are a wide range of methodologies and approaches that support Implementation Research. DRK-12 encourages proposals that:

- research the efficacy and effectiveness of well-developed RMTs that have emerged from earlier research and development efforts, either supported by NSF or through other funding mechanisms;
- study the impacts of involving multiple stakeholders (e.g., researchers, developers and practitioners at the classroom, school, and district level) early in the design, development, and refinement of an innovative RMT;
- investigate how a research and development community identifies potential RMTs that might be developed, adapted, or applied to address a particular problem of practice;
- examine how a community of practice, such as a Network Improvement Community, is formed and works to identify and employ RMTs with evidence of effectiveness;
- investigate the factors that enhance or impede the implementation of an RMT in either the context of Design-Based Implementation Research or in efficacy or effectiveness studies;
- investigate with respect to a particular RMT or class of RMTs what works, for whom, and under what conditions; or
- conduct research on the conditions necessary for scaling the implementation of RMTs to wider contexts.

All Implementation Research proposals should clearly identify both the relevant stakeholder groups who are being brought together to address a specified problem of STEM educational practice and the RMT(s) that will be designed, developed, and/or implemented.

Additional Program Information Applicable to Proposal Types

The DRK-12 program invites proposals for three types of projects: Exploratory; Full Design and Development projects; and, Conferences, Workshops, and Synthesis. The following types of projects are applicable to all strands.

Exploratory proposals provide investigators with opportunities to: (1) undertake early research and development of innovative RMTs; (2) establish plausible hypotheses; (3) develop appropriate measurements; and (4) innovatively repurpose or adapt existing RMTs. Exploratory proposals might address the development of prototype educational materials or practices and conduct research to provide proof-of-concept and preliminary evidence of promise. All Exploratory projects are expected to produce empirical evidence

to inform further research and development work. Proposals for exploratory projects should include detailed information on the process for identifying, adapting or designing appropriate instruments to measure outcomes of the project, including ways to determine appropriate levels of technical quality. The DRK-12 Exploratory proposals 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 proposals build on evidence from prior research and development studies. These proposals begin with RMTs that have already demonstrated promise in small sets of classrooms, schools, or other learning settings. Full Design and Development projects are expected to produce fully developed RMTs that have evidence of feasibility and utility for practice. Resources, models, or tools developed in Full Design and Development projects should result in completed products, ready for implementation by others who request them. The DRK-12 Full Design and Development proposals are consistent with the Design and Development type of research and development in the *Common Guidelines for Educational Research and Development*.

All proposals for Full Design and Development projects should present plans for: (1) producing usable RMTs; (2) creating, validating, and/or employing valid and reliable measures that assess implementation and outcomes; (3) collecting data regarding the feasibility of implementing the RMT in typical delivery settings; and (4) conducting an appropriately rigorous study that (a) examines the RMT's promise for generating the intended outcomes, and (b) provides strong evidence of its potential to improve student learning, enhance teacher practice, and/or expand the capacity of educational systems.

Some Full Design and Development proposals may expand the evidence of promise from previous studies to provide more rigorous measures of the strength of the RMT through efficacy and effectiveness studies. An efficacy study examines the impact of an RMT under ideal conditions, while an effectiveness study examines that impact under normal educational contexts and settings.

All Full Design and Development DRK-12 projects are expected to contribute to theory and to practice. Therefore, all are expected to result in peer-reviewed research and practice publications as well as a product that could be used by others.

Conferences, Workshops, and Synthesis proposals related to the mission of the DRK-12 program are also supported under this solicitation. Conferences or workshops should be well focused, related to the goals of the program, and generate a product usable by researchers or practitioners. Synthesis proposals should address important research, development, and implementation research findings in STEM education and should result in products usable by multiple audiences of educators. DRK-12 particularly encourages synthesis proposals that provide research findings and recommendations that are useful to STEM education practitioners and decision makers.

Please see the Proposal and Award Policies and Procedures Guide/[Grant Proposal Guide](#) Section II. D. for additional information about conference and workshop proposals.

Selected Resources

American Statistical Association (2007). Using statistics effectively in mathematics education research. Retrieved July 9, 2007 from <http://www.amstat.org/education/pdfs/UsingStatisticsEffectivelyinMathEdResearch.pdf>.

Bryk, A.S., Gomez, L.M., and Grunow, A. (2010). *Getting ideas into action: Building networked improvement communities in education*. Stanford, CA: Carnegie Foundation for the Advancement of Teaching. Retrieved July 11, 2013 from http://cdn.carnegiefoundation.org/wp-content/uploads/2014/09/bryk-gomez_building-nics-education.pdf. [Published in *Frontiers in Sociology of Education* edited by Maureen Hallinan, Springer Publishing, July 2011.]

Clements, D. H. (2007). Curriculum research: Toward a framework for "Research-based curricula". *Journal for Research in Mathematics Education*, 38 (1): 35-70.

Cobb, P., Confrey, J., deSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher*, 32(1), 9 -13.

Darling-Hammond, L., Herman, J., Pellegrino, J., et al. (2013). *Criteria for high-quality assessment*. Stanford, CA: Stanford Center for Opportunity Policy in Education, http://edpolicy.stanford.edu/sites/default/files/publications/criteria-higher-quality-assessment_1.pdf

Frechting, J., Mark, M., Rog, D., Thomas, V., Frierson, H., Hood, S., Hughes, G., Johnson, E. (2010) The 2010 User-Friendly Handbook for Project Evaluation, <https://www.westat.com/sites/westat.com/files/2010UFHB.pdf>

Lamberg, T. & Middleton, J. A. (2009). Design research perspectives on transitioning from individual microgenetic interviews to a whole-class teaching experiment. *Educational Researcher* 38(4), 233-245.

National Mathematics Advisory Panel (2008). *Foundations for success: The final report of the National Mathematics Advisory Panel*, U.S. Department of Education: Washington, DC.

National Research Council (2001). *Knowing what students know: The science and design of educational assessment*. Washington, DC: National Academy Press.

National Research Council (2002). *Scientific research in education*. Washington, DC: National Academy Press.

National Research Council (2003). *Assessment in support of instruction and learning: Bridging the gap between large-scale and classroom assessment*. Washington, DC: National Academy Press.

National Research Council (2004). *On evaluating curricular effectiveness: Judging the quality of K-12 mathematics evaluations*. Washington, DC: National Academy Press.

National Research Council (2006). *Systems for state science assessment*. Washington, DC: National Academy Press.

National Research Council (2007). *Taking science to school: Learning and teaching science in grades K-8*, Washington, DC: National Academy Press.

National Research Council (2008). *Research on future skill demands*. Washington, DC: National Academy Press.

National Research Council (2009). *Learning science in informal environments: People, places, and pursuits*. Washington, DC: National Academy Press.

National Research Council (2011). *Successful K-12 STEM education: Identifying effective approaches in science, technology, engineering, and mathematics*. Washington, DC: National Academy Press.

National Research Council (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington DC: National Academy of Science.

National Research Council. (2012). *Education for life and work: Developing transferable knowledge and skills in the 21st century*. Committee on Defining Deeper Learning and 21st Century Skills, James W. Pellegrino and Margaret L. Hilton, Editors. Board on Testing and Assessment and Board on Science Education. Washington, DC: The National Academies Press.

National Science Foundation/National Science Board (2010), Preparing the next generation of STEM innovators: Identifying and developing our nation's human capital.

National Science Foundation (2011), Empowering the nation through discovery and innovation, NSF Strategic Plan for 2011-2016.

Penuel, W.R. and Fishman, B.J. (2012). Large-scale science education intervention research we can use. *Journal of Research in Science Teaching*, 49(3),281-304.

President's Council of Advisors on Science and Technology (2010). Prepare and Inspire: K-12 Education in Science, Technology, Engineering, and Math (STEM) for America's Future. <http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-stem-ed-final.pdf>

Schneider, B., Carnoy, M., Kilpatrick, J., Schmidt, W. H., & Shavelson, R. J. (2007). Estimating causal effects using experimental and observational designs (report from the Governing Board of the American Educational Research Association Grants Program). Washington, DC: American Educational Research Association.

Shadish, W., Cook, T., and Campbell, D. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton-Mifflin Company.

U.S. Department of Education, Office of Educational Technology (March 5, 2010). *Transforming american education: Learning powered by technology*.

Wiggins, G.P., & McTighe, J. (2005). *Understanding by design* (2nd Edition). Upper Saddle River, NJ: Prentice Hall.

[CADRE - Resource network for the DRK-12 Program](#)

III. AWARD INFORMATION

Anticipated Type of Award: Continuing Grant or Standard Grant

Estimated Number of Awards: 35 to 45 per year. It is anticipated that about 15-20 Exploratory awards, 15-20 Full Research and Development awards, and 5 Conference/Workshop/Synthesis awards will be made in FY 2014, pending availability of funds.

Anticipated Funding Amount:

Pending availability of funds, NSF anticipates having approximately \$100,000,000 available over the two fiscal year period FY2014-2015 for support of the DRK-12 portfolio. Approximately \$50,000,000 will be available for the FY2014 competition and approximately \$50,000,000 will be available for the FY2015 competition.

Normal limits for funding requests of DRK-12 proposals are as follows: (1) Exploratory projects up to \$450,000 with duration up to three years; (2) Full Design and Development projects up to \$3,000,000 with duration up to four years; and (3) Conference/Workshop/Synthesis projects up to \$100,000 for duration up to two years.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI:

There are no restrictions or limits.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.5 of the Grant Proposal Guide provides additional information on collaborative proposals.

See Chapter II.C.2 of the [GPG](#) for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the GPG instructions.

Information Applicable to all Proposals

Cover Sheet. Complete this form with the appropriate information. The DRK-12 Program Solicitation number must be entered on the first line of the cover page. (Grants.gov Users: The program solicitation number will be pre-populated by Grants.gov on the NSF Grant Application Cover Page.) All proposals submitted to DRK-12 are assumed to have the potential for conducting research on human subjects. Therefore, proposers must select the human subjects box on the cover sheet and should have prior or pending approval of their research from the appropriate institutional review board (IRB).

Project Summary. Each proposal must contain a summary of the proposed project not more than one page in length. The Project Summary consists of an overview, a statement on the intellectual merit of the proposed activity, and a statement on the broader impacts of the proposed activity.

The first sentence of the Project Summary should specify the type of proposal (e.g., Exploratory; Full Design and Development; or Workshop/Conference/Synthesis) and the Strand addressed. The second sentence should state the discipline or disciplines being addressed and grade level(s), if appropriate.

The overview should include a description of the activity that would result if the proposal were funded and a statement of objectives and methods to be employed. The statement on intellectual merit should describe the potential of the proposed activity to advance knowledge. The statement on broader impacts should describe the potential of the proposed activity to benefit society and contribute to the achievement of specific, desired societal outcomes. The Project Summary should be written in the third person, informative to other persons working in the same or related fields, and, insofar as possible, understandable to a scientifically or technically literate lay reader. It should not be an abstract of the proposal.

Proposals that do not contain the Project Summary, including an overview and separate statements on intellectual merit and broader impacts may not be accepted or may be returned without review

Project Description. The Project Description is limited to 15 pages and must comply with all formatting requirements of the most current Grant Proposal Guide. Proposals funded under this solicitation must focus on a research question or hypothesis about preK-12 STEM learning or teaching.

Proposals must address the following elements in the 15-page project description:

1. **Importance:** The proposal must clearly show how the proposed project addresses critical STEM educational needs, and has the potential for broad impact. The proposal should provide a rationale for how the project will improve STEM education for students and advance knowledge, and it should explain how products or findings might ultimately be implemented in schools. The proposal should address how the proposed products differ from existing practice and why the proposed project has the potential to improve learning or education outcomes beyond what current practice provides.

2. **Results from prior NSF support**

The proposal must describe results of prior NSF support for related educational projects in which the PI or co-PI have been involved. This includes evidence of the quality and effectiveness of any RMTs previously developed, peer-reviewed publications, and information about product use. The proposal must describe how prior work influences this proposal.

3. **Research and Development Design**

The design of any DRK-12 proposal begins with a hypothesis about how some aspect of STEM education can be improved based on theories of learning and development. The proposal then offers a plan for developing an innovative RMT and studying the innovation's promise or impact on STEM learning. The proposal should articulate a plan of work that describes research and development strategies appropriate for attaining its goals. Proposals must demonstrate how the work is related to similar research and development. The proposal should address how the major design iterations and resulting evidence will be developed to support or question key assumptions underlying the research and development plan. The proposal should identify all measures to be developed or employed in generating evidence of the project's success and provide evidence of or plans to establish the technical quality (e.g., validity and reliability) of each measure.

The proposal should include detailed descriptions of the study goals, design and implementation processes, data collection and quality, and analysis and methods for producing findings. For efficacy and effectiveness studies, the core findings should be reliable estimates of the RMT's average impact, and where possible, estimates of impacts for sample subgroups.

The research plan should describe the methods for: (1) developing the intervention to the point where it can be used by the intended end-users (iterative development process); (2) collecting evidence on the feasibility that end-users can implement the intervention in appropriate education or learning settings (evidence of feasibility of implementation); and (3) obtaining

appropriate findings of the promise, efficacy or effectiveness of the intervention to achieve the expected outcomes. The proposal must describe the expertise of the researcher(s) and developer(s) and describe how that expertise relates to the goals and objectives of the proposal. Any iterative testing of the RMT should provide (a) evidence of feasibility, utility and quality to inform the development process, and (b) final evidence of promise or impact.

4. Evaluation or External Review

All DRL projects are subject to a series of external, critical reviews of their designs and activities (including their theoretical frameworks, any data collection plans, analysis plans, and reporting plans). Peer review of the proposed project and ongoing post-award monitoring by NSF staff are two types of external critical review that apply to all DRL projects. A proposal must describe appropriate project-specific external review and feedback processes. These might include an external review panel or advisory board proposed by the project or a third-party evaluator. The external critical review or evaluation should be sufficiently independent and rigorous to influence the project's activities and improve the quality of its findings. Successful proposals will (1) describe the expertise of the external reviewer(s); (2) explain how that expertise relates to the goals and objectives of the proposal; and (3) specify how the PI will report and use results of the project's external, critical review process.

5. Dissemination

A proposal must include a creative communication strategy for reaching a broad audience for the findings of the project, including, where appropriate, scholars, practitioners, policymakers and public audiences. While the potential results of the proposed research are expected to be of sufficient significance to merit peer-reviewed and broader publication, approaches that reach broader audiences are strongly encouraged. Proposals should identify the key elements of a communication plan, e.g., target audiences and identification of the channels/media/technologies appropriate for reaching specific audiences.

6. Expertise

DRK-12 proposals generally involve interdisciplinary teams. Projects typically include STEM education researchers, development experts, experienced teachers, STEM researchers, statisticians, psychometricians, learning scientists and informal learning experts, and policy researchers, as appropriate. When feasible, proposals should include new researchers and developers (e.g., beginning scholars, postdoctoral associates, and graduate students) as part of the project team as a means of building a more diverse community of researchers, designers, and developers. The proposal should include a brief narrative describing the expertise of personnel and their contributions to the proposed work, including those responsible for the project review or evaluation.

7. Broader Impact

Please note that per guidance in the GPG, the Project Description must contain, as a separate section with the narrative, a discussion of the broader impacts of the proposed activities. Proposers can decide where to include this section within the Project Description.

Special Information/Supplementary Documentation:

Limited to four document types:

1. Brief letters of commitment or collaboration are strongly encouraged but not required -- for example, letters from participating schools or advisory panel members.
2. A one-page list of senior staff, affiliations and partner institutions.
3. Postdoctoral Researcher Mentoring Plan, if applicable - as per the Grant Proposal Guide (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg).
4.) Data Management Plan - As per the Grant Proposal Guide (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg).

Proposals with other supplementary material or materials in the appendix section will be returned without review.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited.

Budget Preparation Instructions:

DRK-12 generally does not fund equipment that is normally found in schools, universities, and research and development organizations, such as computers. Requests for equipment must be accompanied by justification for its importance to the operation of the project.

The budget should include a request for funds to cover the cost of attendance of the Principal Investigator at an annual awardees meeting in the Washington, DC area.

DRK-12 does not provide scholarships for undergraduate, pre-service, or other students.

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

December 06, 2013

October 16, 2014

D. FastLane/Grants.gov Requirements

For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-

673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage:

<http://www.grants.gov/web/grants/applicants.html>. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

Proposers that submitted via FastLane are strongly encouraged to use FastLane to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in the GPG as [Exhibit III-1](#).

A comprehensive description of the Foundation's merit review process is available on the NSF website at: http://nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in [Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018](#). These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.

Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. ([GPG Chapter II.C.2.d.i.](#) contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including [GPG Chapter II.C.2.d.i.](#), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
 - a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 - b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. 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?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will be completed and submitted by each reviewer. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process).

B. Award Conditions

An NSF award consists of: (1) the award notice, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the *NSF Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). Within 90 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the *NSF Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

The DRK-12 program has a program-wide evaluation. Awardees will be expected to provide data for the evaluation.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- Inquiries can be made to, telephone: (703)292-8620, email: DRLDRK12@nsf.gov
- David Campbell, telephone: (703) 292-5093, email: dcampbel@nsf.gov
- Julia Clark, telephone: (703) 292-5119, email: jclark@nsf.gov
- Michael Ford, telephone: (703) 292-5153, email: miford@nsf.gov
- David L. Haury, telephone: (703) 292-5102, email: dhaury@nsf.gov
- Margret Hjalmarson, telephone: (703) 292-4313, email: mhjalmar@nsf.gov
- Karen King, telephone: (703) 292-5124, email: kking@nsf.gov
- Rebecca Kruse, telephone: (703) 292-4211, email: rkruse@nsf.gov
- Julio Lopez-Ferrao, telephone: (703) 292-5183, email: jlopezfe@nsf.gov

- Helen T. Martin, telephone: (703)292-8620, email: htmartin@nsf.gov
- Joseph Reed, telephone: (703) 292-5187, email: jreed@nsf.gov
- Ferdinand Rivera, telephone: (703) 292-4960, email: frivera@nsf.gov
- Robert Russell, telephone: (703) 292-2995, email: rrussel@nsf.gov
- Elizabeth VanderPutten, telephone: (703) 292-5147, email: evanderp@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "NSF Update" is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF [Grants Conferences](#). Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. "NSF Update" also is available on NSF's website at https://public.govdelivery.com/accounts/USNSF/subscriber/new?topic_id=USNSF_179.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this mechanism. Further information on Grants.gov may be obtained at <http://www.grants.gov>.

This solicitation has been revised to incorporate into the Other Information section a newly issued publication jointly developed by National Science Foundation and the Institute of Education Sciences in the U.S. Department of Education entitled, *Common Guidelines for Education Research and Development*. The *Guidelines* describe six types of research studies that can generate evidence about how to increase student learning. Research types include those that generate the most fundamental understandings related to education and learning; examinations of associations between variables; iterative design and testing of strategies or interventions; and assessments of the impact of a fully-developed intervention on an education outcome. For each research type, there is a description of the purpose and the expected empirical and/or theoretical justifications, types of project outcomes, and quality of evidence.

The *Guidelines* publication can be found on the NSF website with the number NSF 13-126 (<http://www.nsf.gov/pubs/2013/nsf13126/nsf13126.pdf>). A set of FAQs regarding the *Guidelines* are available with the number NSF 13-127 (<http://www.nsf.gov/pubs/2013/nsf13127/nsf13127.pdf>). Grant proposal writers and PIs are encouraged to familiarize themselves with both documents and use the information therein to help in the preparation of proposals to NSF.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <http://www.nsf.gov>

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information**
(NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

Send an e-mail to: nsfpubs@nsf.gov

or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, [NSF-50](#), "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and [NSF-51](#), "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

Suzanne H. Plimpton
Reports Clearance Officer
Office of the General Counsel
National Science Foundation
Arlington, VA 22230

[Policies and Important Links](#) | [Privacy](#) | [FOIA](#) | [Help](#) | [Contact NSF](#) | [Contact Web Master](#) | [SiteMap](#)



The National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230, USA
Tel: (703) 292-5111, FIRS: (800) 877-8339 | TDD: (800) 281-8749

Last Updated:
11/07/06
[Text Only](#)