Discovery Research K-12 (DR-K12)

Program Solicitation
NSF 08-609

Replaces Document(s):
NSF 08-502

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):

January 08, 2009

January 07, 2010

REVISION NOTES

A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), NSF 09-1, was issued on October 1, 2008 and is effective for proposals submitted on or after January 5, 2009. Please be advised that the guidelines contained in NSF 09-1 apply to proposals submitted in response to this funding opportunity. Proposers who opt to submit prior to January 5th, 2009, must also follow the guidelines contained in NSF 09-1.

One of the most significant changes to the PAPPG is implementation of the mentoring provisions of the America COMPETES Act. Each proposal that requests funding to support postdoctoral researchers must include, as a separate section within the 15-page project description, a description of the mentoring activities that will be provided for such individuals. Proposals that do not include a separate section on mentoring activities within the Project Description will be returned without review (see the PAPP Guide Part I: *Grant Proposal Guide* Chapter II.C.2. d for further information).

This revised Discovery Research K-12 (DR-K12) program solicitation has been restructured in order to clarify the call for proposals. The first major change is the elimination of the separate *Contextual* and *Frontier* strands in the previous solicitation. The DR-K12 program goal is to support projects along a continuum, from those that respond to immediate concerns and issues within the current educational context to those that anticipate education as it could be in future decades. The second major change is the consolidation of the five DR-K12 challenges in the previous solicitation into three, and the introduction of implementation studies as a fourth challenge. The four DR-K12 challenges now focus on assessment, STEM learning, teacher practice and implementation. The new implementation challenge calls for studies that examine how promising resources, models and technologies can be implemented, sustained, and scaled in the formal education settings they are intended to serve. The program scope has been broadened to include research and development at the preK level. In addition, new language encourages projects that support cyber-enabled learning and/or that hold promise to transform current educational practice and research.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Discovery Research K-12 (DR-K12)

Synopsis of Program:

The Discovery Research K-12 (DR-K12) program seeks to enable significant advances in preK-12 student and teacher learning of the STEM disciplines through the development, implementation, and study of resources, models, and technologies for use by students, teachers, and policymakers. Activities funded under this solicitation begin with a research question or hypothesis about effective preK-12 STEM learning and teaching; develop, adapt, or study innovative resources, models, or technologies; and demonstrate if, how, for whom, and why their implementation affects learning.

DR-K12 invites projects that meet a variety of educational needs, from those that address immediate and pressing challenges facing preK-12 STEM education to those that anticipate opportunities for the future. DR-K12 encourages proposals that challenge existing assumptions about learning and teaching within or across STEM fields, envision needs of learners in 10-15 years, and consider new and innovative ways to reach students and teachers. All projects should be informed by current research and broaden the boundaries of schools and disciplines. DR-K12 accepts research and development, exploratory, and synthesis projects, as well as conferences and workshops related to the mission of the DR-K12 program.

Cognizant Program Officer(s):

- Inquiries should be made to either, telephone: (703)292-8620, email: DRLDRK12@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: 50 to 70 per year. It is anticipated that about 20-25 Research and Development awards, 20-25 Exploratory awards, 5-10 Synthesis awards, and 5-10 Conference and Workshop awards will be made in FY 2009 and FY 2010, pending availability of funds.

Anticipated Funding Amount: $50,000,000 each year in FY 2009 and FY 2010 for new awards made under this solicitation, pending availability of funds. Research and development projects are up to $3,500,000 with duration of up to five years, with the exception of those that focus on the implementation challenge which are up to $5,000,000 over five years. Exploratory projects would normally be up to $450,000 with a duration of up to three years. Synthesis projects are up to $250,000 with a duration of up to two years. Conference/Workshop proposals are permitted to request up to $100,000 for a duration of up to two years.

Eligibility Information

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **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/pubs/policydocs/grantsgovguide607.pdf)

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required under this solicitation.
- **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):

  January 08, 2009

  January 07, 2010

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.

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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, technology, engineering and mathematics (STEM) research and education enterprises. As part of this mission, the Directorate for Education and Human Resources (EHR) has primary responsibility for providing national and research-based leadership in STEM education. EHR promotes five themes in fulfilling this responsibility through:

1. Broadening participation to improve workforce development;
2. Promoting cyber-enabled learning strategies to enhance STEM education;
3. Enriching the education of STEM teachers;
4. Furthering public understanding of science and advancing STEM literacy; and
5. Promoting learning through research and evaluation.

To address these themes, the Directorate sponsors programs in the Divisions of Research on Learning in Formal and Informal Settings (DRL), Undergraduate Education (DUE), Graduate Education (DGE), and Human Resource Development (HRD).

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

DRL invests in projects to enhance STEM learning for people of all ages. Its mission includes promoting innovative and transformative research, development, and evaluation of learning and teaching in all STEM disciplines in both formal and informal learning settings. DRL programs encourage the participation of scientists, engineers, and educators from the range of disciplines represented at NSF. New and emerging areas of STEM must figure prominently into efforts to improve STEM education. The integration of cutting-edge STEM content and the engagement of STEM researchers is encouraged in all DRL initiatives. In the larger context of Federal support for education research and evaluation, DRL's role is to be a catalyst for change, advancing theory, method, measurement, development, evaluation, and application in STEM education. The Division seeks to support both early, promising innovations, as well as larger-scale adoptions of proven educational

innovations. In doing so, it challenges the field to create the ideas, resources, and human capacity to bring about the needed transformation of STEM education for the 21st century.

The Division's programs offer a set of complementary approaches for advancing research, development, and field-based improvements.

- The Research and Evaluation on Education in Science and Engineering (REESE) program advances research at the frontiers of STEM learning, education, and evaluation, and provides the foundational knowledge to improve STEM teaching and learning at all educational levels and in all settings.
- The Discovery Research K-12 (DR-K12) program enables significant advances in K-12 student and teacher learning of the STEM disciplines, through research and development of innovative resources, models, and technologies for use by students, teachers, administrators and policy makers.
- The Informal Science Education (ISE) program builds on educational research and practice to increase interest in, engagement with, and understanding of STEM by individuals of all ages and backgrounds through self-directed learning experiences.
- The Innovative Technology Experiences for Students and Teachers (ITEST) program enhances participation in the U. S. STEM and information and communication technology (ICT)-intensive workforce, through the design, implementation, scale-up and testing of strategies for students and/or teachers, and through research studies about issues related to STEM workforce participation .

Each of these programs is intended to improve the capacity of their respective fields to further STEM learning. They are central to NSF's strategic goals of *Learning* and *Discovery,* helping to cultivate a world-class, broadly inclusive STEM workforce, expanding the scientific literacy of all citizens, and promoting research that advances the frontiers of knowledge.

All research and development activities within DRL aim at generating knowledge and transforming practice in STEM education. DRL's programs are designed to complement each other within a cycle of innovation and learning (see Figure 1) that forms the conceptual framework for its programs (adapted from RAND, 2003, American Statistical Association, 2007, NSF, 2005). All DRL programs are concerned with all five components of the cycle, to different degrees.

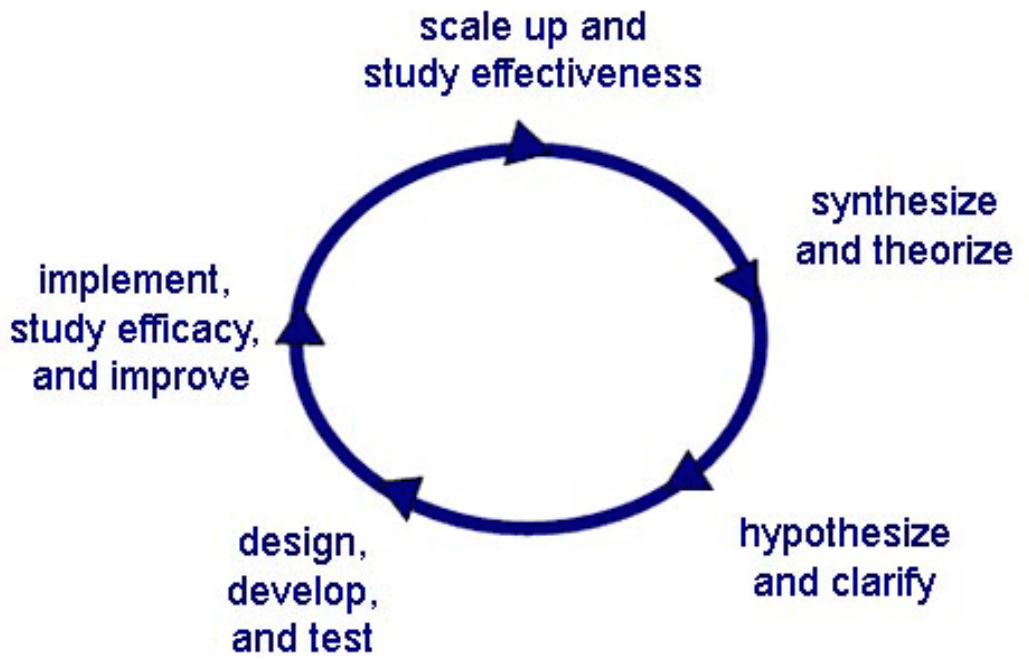

Figure 1 Cycle of Innovation

Each part of the cycle, represented by the activities of DRL's programs, forms the vital and compelling foundation for transition to the next part of the cycle; the research, development, and implementation activities need to be rigorous, as appropriate. From challenging the STEM educational and research communities with transformative ideas, to conducting the pioneering and pragmatic research necessary to advance those goals, to developing world-class instructional materials and resources for teachers and students to advance their knowledge of STEM teaching and learning, to engaging all citizens and residents of the United States in learning and as future technologists, scientists and engineers, DRL is providing the ideas, resources, and human capacity to advance STEM learning and education in the 21st century.

The major distinction between DR-K12 and REESE is that DR-K12 focuses specifically on issues of *K-12 learning* and projects will involve either a *substantial development component, or will study the implementation of particular resources, models and technologies for the purpose of informing future design and implementation*--the **design, develop, and test** and **implement, study efficacy, and improve** components of the cycle. REESE focuses primarily on *building theory and knowledge through research and evaluation*, across learning contexts and ages--the **synthesize and theorize; scale-up and study effectiveness;** and **hypothesize and clarify**components in the cycle (NRC, 2002, and AERA, 2007). The outcomes of DR-K12 projects will be resources, models, or technologies that are grounded in or informed by research or practice, as well as research findings about the implementation and impact of K-12 STEM education resources, models and technologies. The primary outcomes of REESE projects will be research findings, methods, and theoretical perspectives.

II. PROGRAM DESCRIPTION

The goal of the DR-K12 program is to enable significant advances in preK-12 student and teacher learning of the STEM disciplines through the development, implementation, and study of resources, models, and technologies. All activities funded under this solicitation must be based upon a research question or hypothesis about effective preK-12 STEM learning and teaching. Two types of projects are accepted: projects to develop or adapt innovative resources, models, or technologies and to conduct research on their effects on learning and teaching; and, projects to conduct research on the implementation and impact of previously developed and promising resources, models, and technologies

In DR-K12, *resources* include such materials for learning as curriculum modules, replacement units, supplementary materials, course materials, assessment instruments, or teacher professional development activities, any of which may come in print, media, networked, or virtual forms. *Models* comprise curricular frameworks, curricular learning progressions, teacher education and professional development program design frameworks, standards, and other guides for learning and teaching. *Technologies* include opportunities for cyberlearning (learning that is mediated by networked computing and communication technologies), via such modes as computer software, labware, networking and collaboration tools, web-based resources, on--line gaming, virtual learning environments, or portable digital media. Because both hardware (memory, computation, interfaces, and connectivity) and supportware (operating systems, applications, and human understanding of their use) are evolving rapidly, projects to develop and study technologies should build in the assumption that the possibilities will be greater in each successive year of the grant. DR-K12 recognizes that the research questions and methodology may change as the work moves from prototype to more mature interventions.

DR-K12 encourages proposals for projects that are potentially transformative. Such projects would go beyond what is easily extrapolated from current research and practice and lay the foundation for transformation of preK-12 educational institutions and those who work within them. These projects would have the potential to lead to paradigm shifts for education, by challenging commonly held beliefs about how children or teachers learn, what they can learn, how education should be organized and delivered, the relationship between in-school and out-of-school learning, access to information, and other features of today's education. Such projects also might help transform research methods and analytic procedures used in the development and research study of resources, models, and technologies.

DR-K12 seeks to balance its portfolio by supporting work ranging from that of immediate applicability to work that anticipates and provides the foundation for preK-12 education as it could be in future decades. Projects that address immediate and pressing challenges typically develop and study resources, models, and technologies that could be implemented and brought to scale in the relative near term, in highly innovative and potentially transformative ways. Projects that anticipate education as it could be in 10-15 years, and beyond, put forward ideas, concepts, theories, and modes of research and development that may challenge existing assumptions about STEM learning and teaching. Such projects should envision educational systems that are dramatically more effective with the diversity of learners they will serve; where STEM learning can be supported with collaborative and interactive tools for cyberlearning; where the experts and resources from whom students and teachers learn may be scientists, practitioners, and experts far from the classroom or teacher education setting; and where the boundaries between in-school and out-of-school learning are blurred.

DR-K12 accepts proposals for research and development projects, exploratory projects, synthesis projects, and conferences/ workshops. Most projects, especially research and development projects, are expected to have interdisciplinary collaborations.

Abstracts of current DR-K12 projects can be found at http://www.nsf.gov/div/index.jsp?div=DRL.

A. DR-K12 Program Challenges

The DR-K12 program seeks proposals that address one or more of the following challenges in preK-12

STEM education. DR-K12 projects should build knowledge of effective assessment, curriculum design, instruction, teacher preparation and professional development, and/or implementation. DR-K12 expects to support a variety of projects that develop solutions or generate findings important in time frames ranging from the near- to far-term.

1. **How can assessment of relevant STEM content improve preK-12 teaching and learning?**

   In an era of increased accountability in preK-12 education, resources, models, and technologies for assessing STEM content must keep pace with and anticipate the demands of policy and instruction (National Research Council [NRC], 2001). Among the pressing issues is the alignment of preK-12 assessments with the content and learning goals held by teachers and policy makers. Assessing the full scope of mathematical, scientific and technological proficiency (e.g., as defined in NRC, 2001; NRC, 2006; National Mathematics Advisory Panel, 2008) in valid and reliable ways presents conceptual, psychometric, and practical challenges. DR-K12 is interested in a wide range of assessments, and seeks proposals for projects that will study and develop classroom assessments that are consistent with research-based knowledge about student STEM learning (NRC, 2003) and/ or study how new forms of assessments can be implemented (NRC, 2001). Proposals also may study and create models and tools for state assessment systems that incorporate multiple strategies and forms and organize content around "big ideas" (NRC, 2006). Proposals that examine the efficacy of end-of-course examinations and the development of alternative strategies for assessment are welcome. Formative assessment is an important tool for understanding how students come to learn concepts and processes, as well as a tool that can lead to improved student learning (see National Mathematics Advisory Panel, 2008), so proposals that investigate this area are encouraged. Research that examines the relationship between assessment practices and student performance is needed, as is research on the measurement of STEM education-related outcomes such as engagement, motivation, aptitude, creativity, knowledge transfer, etc.

   There are parallel issues about teacher assessment, including challenges to better define the nature and characteristics of assessments used in measuring STEM teachers' content and pedagogical knowledge, identification of teacher candidates, licensure, professional advancement, and evaluation. Fundamental research and development about the skills, knowledge, and performances needed by teachers to enable STEM learning in their students are unresolved, and further development of tools for assessing those skills, knowledge, and performances is needed.

   DR-K12 seeks proposals to address issues of assessment for both students and teachers, and encourages research and development in the following areas: instruments to measure STEM learning in preschool, elementary, middle, and secondary grades; formative and instructionally embedded assessments in preK-12 STEM; and teachers' knowledge of science and technology for teaching. Proposals addressing assessment issues beyond these areas are also eligible.

   The resources, models, and technologies that might be produced, adapted, and studied could include assessment items, tasks, or instruments; assessment blueprints; domain definitions; test specifications; or validation methods. Analyses of assessment tools or frameworks, comparison of effects of different assessment approaches, and syntheses of relevant research to help assessment developers and policy makers are eligible. Interdisciplinary collaborations including psychometricians and STEM disciplinary experts are encouraged.

2. **How can all students be assured the opportunity to learn significant STEM content?**

   The imperative of ensuring a STEM-literate populace and a STEM-ready workforce has never been more prominent in national discourse. This creates enormous pressures on the preK-12 system to make wise decisions about curricular emphases in the STEM disciplines. The STEM content of the nation's preK-12 schools is influenced by a complex mix of disciplinary traditions, history, practices, standards, and assessments. Currently, state standards specify content by grade level in mathematics, science, and other STEM disciplines, making innovations in curricular emphasis and content especially challenging. In addition, students in the nation's schools have become more diverse with respect to their cultural, linguistic, economic, and educational backgrounds, making the classroom both a complex and enriched environment for students and teachers. Current mandates for increasing U.S. STEM competitiveness and capacity to participate in the

global economy recognize the importance of a preK-12 STEM education system that broadens access to successful participation in the STEM disciplines to all students. Given the rapid growth of STEM knowledge and the concomitant flux in the knowledge and skills required to work in STEM careers, lifelong opportunities to learn and renew one's knowledge are likely to be features of any STEM-related career.

DR-K12 seeks proposals to develop and study innovative resources, models, and technologies that can accelerate the nation's capacity to enable more students to have access to the most important current and emerging ideas, concepts, and processes of STEM content. Projects should be directed specifically both at deepening learning and expanding access to learning to prepare students for life in a knowledge-based, innovation-driven world. Efforts are needed to develop STEM curricular content and professional development to successfully prepare students for entry into the technological workforce, including the curricular shifts necessitated by the growth of STEM knowledge and the advent of cyberlearning. DR-K12 is interested in research and development efforts that address how different students learn STEM content and how cutting-edge STEM content can be appropriately taught to students. Proposals to do this must describe how these ideas will aid students in developing a coherent and ever-more sophisticated understanding of STEM content, how STEM knowledge is generated, and how new ideas are investigated. Projects to study or to develop and study resources, models, or technologies to enhance STEM teachers' capabilities for working with a diverse student population are encouraged.

DR-K12 encourages proposals in the following areas: student and teacher readiness for algebra in the middle grades; preparing high school students for post-secondary (community college and four-year college) mathematics courses; teaching developmentally appropriate, complex STEM concepts and processes to younger learners; teaching interdisciplinary science with policy implications (e.g. environmental science); learning STEM practices, modes of inquiry, and engineering design through hands-on and virtual laboratory experiences; studying the impact of using "real-world" contexts in the learning of STEM content; incorporating the successful practices of informal education into schools; and providing significant STEM learning activities that accommodate the broad range of learners found in classrooms. Proposals that are concerned with introducing abstract or complex STEM concepts and processes or cutting-edge, research-based content into the preK-12 curriculum must address how curricular coherence and foundational preparation will be ensured, and how these proposed curricular additions relate to typical curricular arrangements.

Formal and informal educational environments provide different ways for students to learn STEM. Local and global communities have potential to play a vital role in improving students' access to STEM learning, and in developing a citizenry and a workforce empowered by technological skills and literacy (NRC, 2008). DR-K12 is interested in research and/or development of innovative programs that link different learning environments in ways that enhance learning of students and teachers. Proposals could develop and/or study, for example, collaborations of preK-12 schools with out-of-school, science-rich venues, such as university outreach programs, local industries, science centers, communities, and other science-education organizations.

Projects that examine questions about the characteristics of instructional materials--that is, the impact of such features as the format of materials, the impact and role of motivational material and ancillary material, and the role of representations and links to other resources--have the potential to inform the design of instructional materials. In addition, research is needed on the characteristics of effective design of educative materials for students and teachers.

Projects responding to this challenge might develop and study innovative instructional materials, course modules, curricular learning progressions, teacher education or professional development models, or technology-based resources such as web-based STEM-learning activities, exploratory virtual environments, gaming and other immersive and interactive environments, visualization technologies, virtual instruments, simulations, or virtual collaboratories. Collaborations with researchers in the STEM disciplines are strongly encouraged. Research syntheses that would support practitioners and policymakers concerned with promoting STEM learning to diverse audiences are welcome.

3. **How can the ability of teachers to provide STEM education be enhanced?**

Innovative resources, models, or technologies can support lifelong teacher learning to transform STEM teaching practice. The digital age provides opportunities for continual teacher learning and growth and enables the redefinition of teaching practice. Pre-service teachers, early career STEM teachers, technical education teachers, or teachers moving from other STEM careers into teaching may especially benefit from new resources. Projects addressing this challenge should help pre-service and/or in-service teachers acquire the skills, knowledge, confidence and tools they need to meet the emerging educational challenges they will face in a context of rapidly changing technologies and evolving content in many areas of STEM. Projects should anticipate the future advantages and needs of students and teachers in the global environment and with an expanding cyberinfrastructure. For example, teaching practice can benefit considerably from near-instant access to the enormous collection of resources, data, and expertise, and a growing array of networked resources might support self-directed teacher learning. Projects that study the expansion or scaling of pre- and in-service teacher education models are also encouraged. Proposals must establish the efficacy of the model based upon prior research.

Possible resources, models, and technologies to be studied, or developed and studied, in this area might include just-in-time online courses; digital library-type repositories (e.g., the National Science Digital Library, http://nsdl.org/); models for teacher networking and collaboration; storage and search systems; tools to allow immediate communication with peers, parents, and experts around the world; multi-dimensional diagnostic information about students; supports for streamlining assessment processes; mentoring systems; ways of using web-resources for teaching; or self-assessment tools. Synthesis projects that bring together current technology--enhanced resources and models to point to new directions and needs are allowed. More generally, projects that develop and study new resources, models, or technologies for teacher learning, including design and implementation of programmatic interventions at the pre-service, induction, or professional development stages are eligible.

DR-K12 recognizes that a well-prepared and supported teacher workforce is crucial to the sustained excellence of preK-12 STEM education. DR-K12 seeks proposals to study existing programs and develop innovative models that support preK-12 teacher learning at all points in their careers. Projects might study and/or develop innovative professional development, materials for facilitators and teacher educators, new forms of early teaching experiences for pre-service teachers, or ways to integrate emerging sciences into teacher preparation. As with all DR-K12 projects, these should build on an explicit theory of learning and include strong research designs. DR-K12 encourages proposals to study and/or develop mechanisms for continual growth of teacher learning. Examples might include the use of networking technology to support teachers developing shared lessons or analyzing how research findings could inform and improve their teaching practice.

DR-K12 is interested in studies of the factors that contribute to the successful implementation of innovative models for pre- and in-service teacher education. A project might study, for example, how teaching practice is impacted by the co-education of pre-service and in-service teachers. Studies might examine programs that provide financial and other incentives to recruit STEM majors and professionals into teaching. Research might also focus on the effectiveness of alternative pathways to STEM certification or differential compensation programs for STEM teachers, or on identifying the characteristics of faculty or professional development providers and the types of support they need to be effective.

4. **How can promising innovations be successfully implemented, sustained, and scaled in schools and districts in a cost effective manner?**

Many studies of innovative resources, models, or technologies have demonstrated positive effects on student or teacher STEM learning in small numbers of sites or under carefully controlled conditions. The studies addressing this challenge should seek to understand how innovative resources, models, or tools can be effectively implemented in classrooms, schools, or districts. These resources, models or technologies may include work supported by NSF, by other federal agencies or by private industry.

Proposals for this challenge must provide sufficient evidence that the resource, model, or technology chosen for study shows promise and had a positive effect on student or teacher learning under specific conditions. This can best be demonstrated by previous rigorous experimental or quasi-experimental studies involving random assignment or well-matched comparisons. Meta-analysis of related studies might also be given in evidence.

Studies are encouraged that determine the resources, professional development, materials, policies, assessments, and other factors necessary to successfully implement projects in schools on a larger scale. Examples of implementations to be studied could include a district program for the induction of teachers, the introduction of a new technology, or the adoption of a major new curriculum.

Studies of scale: These studies would examine how an innovation can be effectively institutionalized and sustained in classrooms, schools, and districts. They may be based in one or more districts, but must include a significant number of schools or classes. Research questions might focus on the factors that contribute to effective implementation which might include leadership, fidelity of implementation, teacher professional development, community involvement, or alignment with state standards. Qualitative designs may be appropriate to document the implementation for studies of scale. However, quantitative studies that systematically vary different support mechanisms may be necessary to isolate the effects of different types of support. Studies of scale must identify the outcome measures and address their validity and reliability.

Studies of effects: These studies would examine whether or not the student learning gains found in smaller studies are sustained when an innovation is implemented in large numbers of classes, schools, or other situations. These projects must identify how learning gains will be assessed. It is expected that student learning will be assessed by valid and reliable instruments. Because these studies aim to attribute learning gains to an intervention, the design must involve an adequate number of diverse schools or classes. Experimental studies with random assignment are encouraged. Longitudinal studies of student achievement may be appropriate for studies of effects.

B. **Additional Program Information Applicable to Proposal Types**

Proposals for four types of projects are invited: research and development projects, exploratory projects, synthesis projects, and conferences/workshops. All projects are expected to produce publications.

Research and development projects are focused on the *design, implement,* and *scale-up* parts of the cycle in Figure 1. They are likely to have an iterative research and development design. For example, projects that seek to study a learning or design question through the development of new resources, models, or technologies may focus on design, early development, and proof-of-concept testing in the first stage. Research and evaluation are likely to be formative in nature, providing information needed for the redesign of the resources, models, or technologies. Small, rigorous efficacy studies of student or teacher learning during this stage may be appropriate. Research proposals that examine the implementation and effects of previously developed resources, models and/or tools are likely to study larger populations of students or teachers in more diverse settings. The proposal should lay out the hypotheses about STEM learning or about materials design that are being tested and the project's stages, including the appropriate research questions for each stage.

Exploratory projects are focused on the *hypothesize and clarify* and the *design* parts of the cycle in Figure 1. Exploratory projects are not simply smaller-scale full research and development projects. Their purpose is to allow researchers and developers an opportunity to undertake the preliminary work needed to clarify constructs, assemble theoretical or conceptual foundations, or perform analytic or empirical preparatory research about learning issues or characteristics of resources, models, or technologies. These explorations should produce empirical evidence that forms the basis of anticipated further research and development. Exploratory projects test the reasonableness of ideas and feasibility of methods and must begin with a research question or hypothesis about preK-12 STEM learning and teaching.

Synthesis projects are small grants for the synthesis of existing knowledge on a topic of critical importance to preK-12 STEM education. Synthesis proposals should identify areas where the knowledge base is sufficiently robust to support strong scientific claims, identify areas of importance to education research and development, and propose rigorous methods for synthesizing findings and drawing conclusions from a range of relevant literatures. Proposals should also identify and defend the criteria to be used for including or excluding studies. Workshops and other meetings may be included as part of the synthesis process.

Conferences and workshops related to the mission of the DR-K12 program are supported. Budgets are expected to be consistent with the duration of the event and the number of participants, but the cost will normally not exceed a total of $100,000 for up to two years. Conferences or workshops should be well-focused and related to the goals of the program. Please see the Grant Proposal Guide Section II. D. for

additional information about conference and workshop proposals. Proposals may be submitted at any time, generally at least one year in advance of when the conference would be held. Proposers should contact a program officer before submitting proposals for such events. All conference proposals should provide for an evaluation of the impact of the conference done 12 months after the conference is completed.

III. AWARD INFORMATION

The requested funds and the duration of the project should be commensurate with the task and the importance of the project in answering key questions or providing important resources to the Nation. Research and development projects are normally up to $3,500,000 with a duration of up to five years, with the exception of those that focus on the implementation challenge which are up to $5,000,000 over five years if justified by the scope and size of the project. Exploratory projects are normally up to $450,000 with a duration of up to three years. Synthesis projects are up to $250,000 with a duration of up to two years. Conference/Workshop proposals are permitted to request up to $100,000 for a duration of up to two years. Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

IV. ELIGIBILITY INFORMATION

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

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

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 pubs@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/pubs/policydocs/grantsgovguide607.pdf). 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 pubs@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.3 of the Grant Proposal Guide provides additional information on collaborative proposals.

A. Proposal Preparation Instructions

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

- 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 pubs@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.

- 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/bfa/dias/policy/docs/grantsgovguide.pdf). 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 pubs@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.3 of the Grant Proposal Guide provides additional information on collaborative proposals.

Information Applicable to all Proposals

Cover Sheet. Complete this form with the appropriate information. The human subjects box must be checked and appropriate information entered if data about individuals are to be collected.

Project Summary. The first sentence of the Project Summary must specify the type of proposal (e.g., research and development, exploratory, synthesis) and the challenge addressed. When appropriate the second sentence should state the discipline being addressed and audience for the project. Conference/workshop proposals do not need to provide this information, but should be explicit about the focus, content and audience. Unless the two National Science Board criteria--intellectual merit and broader impacts--are addressed explicitly in separate statements in the project summary, the proposal will be returned without review.

Project Description. Project descriptions are limited to 15 pages and must comply with all formatting requirements of the most current Grant Proposal Guide. Proposals funded under this solicitation must begin with a research question or

hypothesis about preK-12 STEM learning.

All proposals for the DR-K12 solicitation must address the following elements in the 15-page project description:

1. **Goals and purpose**

   Proposals of all types (Research and Development, Synthesis, Exploratory and Conferences/Workshops) must articulate the goals of the proposed project and why the goals are important for STEM education. These goals should be linked to one or more of the challenges in described above. The project should provide a rationale for how the project will improve STEM education for students and teachers and advance knowledge. A detailed, high quality research design, together with a design for development in the case of projects producing new materials, must form the basis for how the project will achieve its knowledge claims.

2. **Research and Development Design**

   A. **Development and Study of New Resources, Models, and Technologies**

   Proposals for projects that develop and study new resources, models, and technologies should describe the research and development designs, and how they are integrated. These designs should provide the basis for demonstrating how, why, and for whom the intervention or innovation is effective.

   A1. Development Designs: Proposals that include development of *new* resources, models, or technologies should describe the STEM content, the learning goals, the pedagogical approach, and the needs of students, teachers, other practitioners, or policymakers to be addressed. The nature and scope of the resource, model, or technology should be defined (e.g., a three-week module for third grade science, a one-semester on-line course for mathematics teachers). Proposals should describe the framework that will guide the design as well as the development process (e.g. Clements, 2007). They should explain how particular and relevant design approaches, such as universal design principles (e.g., www.cast.org) or backward design (e.g., Wiggins & McTighe, 2005) will be incorporated as appropriate. Proposals must also outline the process to ensure that the resources, models, or technologies are scientifically accurate and pedagogically appropriate. The proposal should describe how pilot and field testing will provide evidence on how students and/ or teachers use, interpret, and learn from the resource, model or technology and describe how the evidence will inform subsequent revisions and refinements.

   A2. Research Designs: Proposals must articulate specific research questions or testable hypotheses. The proposal should show how the questions or hypotheses are informed by current literature and are based on a theoretical or conceptual framework. Sufficient evidence should be provided that the proposed design, sampling, data collection techniques, instrumentation, and data analysis will answer the questions. The proposal should describe how the research design will tie together the questions or hypotheses, the literature, the conceptual framework, and the sampling, instrumentation, and data collection and analysis.

   Some projects with development components will have an iterative design for both research and development; in such cases the proposal should define the process. For example, the project might begin with the design, development, and testing of a prototype resource, model, or technology and later move to assessment of efficacy. Research in the preliminary phase might include design experiments, teaching experiments, qualitative case studies, and other hypothesis-generating and formative research. The proposal should explain how the results of this preliminary phase will inform later phases of both the research and development.

   For projects that expect to make causal claims (at any level or of any type), the most appropriate research designs are experimental or quasi-experimental methods, (Shadish, Cook, & Campbell, 2001; Schneider, Carnoy, Kilpatrick, Schmidt, & Shavelson, 2007).

   Proposals need not (and in many cases should not) limit their research designs to experimental or quasi-experimental methods. Such methods may be employed to test one or more elements of the project's knowledge goals (e.g., examine a specific component or subset of the developed materials) or may be employed along with other research methods and methods of causal inference (Clements, 2007; Schneider et al., 2007) as appropriate. In cases where experimental or quasi-experimental methods are not appropriate in any form, the proposer must address why such methods cannot or should not be used.

Proposals should provide appropriate power analyses, effect sizes, and describe how threats to internal and external validity will be ruled out or resolved.

B. **Studies of Existing Resources, Models and/or Technologies**

Proposals to conduct studies of *existing* innovative resources, models, or technologies must provide a rationale for why the particular innovation was selected for study. Such studies are not limited to resources, models and technologies developed with NSF funding. Evidence should be presented that previous efficacy studies have shown an impact on teacher or student learning, preferably with a discussion of how different sub-groups are affected by the resources, models or technologies. The proposal should explain how the findings of the research will contribute to the improvement of the design and implementation of resources, models, or technologies to improve preK-12 STEM education for students and/or teachers. Well-designed studies comparing different approaches are welcome (NRC, 2004).

C. **Synthesis Proposals.** S*ynthesis* proposals should identify areas where the knowledge base is sufficiently robust to support strong scientific claims; identify areas of importance to education research, evaluation or practice; and propose rigorous methods for meta-analysis and/or synthesis of findings and drawing conclusions from a range of relevant literatures. Proposals should identify the criteria to be used for including or excluding studies.

D. **Exploratory Proposals.** Exploratory proposals should include a research design that is appropriate to the questions and knowledge goals to be explored and should justify how the proposed design will yield information useful in assessing the reasonableness of the ideas, the feasibility of future projects, and/or produce empirical evidence that forms the basis of anticipated further research and development.

3. **Evaluation**

All projects are expected to include an evaluation plan that examines the extent to which the project has met its goals. The proposal should describe how the objectivity of the evaluation will be ensured. Summative components of evaluations must be conducted by a researcher or evaluator external to the project and submitted with the NSF final project report. The proposal should specify the evaluation questions, the methods to be used, the data to be gathered, and the data analysis plans. Responsibilities should be clearly defined. For formative evaluation, plans should address how appropriate feedback will be given to the project leadership team so that it can make modifications to the project activities and address significant issues in the annual report.

All resources, models, and technologies developed must undergo independent review by qualified experts in the relevant STEM discipline (e.g., scientists, mathematicians, engineers) and in STEM pedagogy. This may be done by an advisory committee with appropriate expertise. Members may be from the same or different institutions, but must be outside the project. The proposal must also include plans for the expert review of the research design, methodologies, and execution by objective, independent advisors, who may be different from the evaluators.

For synthesis, exploratory, and conference/workshop projects, the evaluation will normally be carried out by an advisory committee, composed of content, pedagogical, and methodological experts. In many cases, the role of these committees may evolve from purely advisory to adjudicatory/evaluative in the vetting the research findings, claims, or outcomes and the interpretations of such.

There will be a third-party DR-K12 program evaluation designed and implemented by external evaluator(s) to track the program's progress in meeting overall goals. All projects are expected to collaborate with this program evaluation.

4. **Dissemination**

Proposals should include plans for effective dissemination of research and project findings to researchers, policymakers, and practitioners. The dissemination plan should include a description of anticipated contributions of the research and/or activities to teachers, schools, preK-12 administrators, teacher educators, STEM education researchers, or policymakers. Dissemination strategies may vary and should be appropriate for the intended audiences. Projects will be expected to share research designs, findings, and overall project information with the DR-K12 Resource Network, and possibly report annually to an online data system.

5. **Expertise**

DR-K12 projects generally involve interdisciplinary teams. In all cases, proposals must describe the expertise needed for the work, how this expertise is incorporated in the project and who is responsible for each component. Projects should include STEM education researchers, development experts, experienced teachers, STEM researchers, statisticians, psychometricians, informal learning experts, and policy researchers, as appropriate. When feasible, projects should include future researchers and developers (e.g., beginning scholars, postdoctoral associates, graduate students) as part of the project team as a means of building a more diverse community of researchers and developers. Proposals should include a brief narrative describing the expertise of personnel and their contributions to the proposed work.

6. **Results from prior NSF support**

The proposal must provide evidence for the results of prior NSF support for related educational projects in which senior personnel have been involved. In cases where previous projects have resulted in findings, assessments and/or materials related to the proposed work, include a summary of the past project evaluation that provides compelling evidence of the quality and effectiveness of the resources, models, and technologies developed. How prior work influences this proposal should be discussed as part of the description of the project.

Biographical Sketches (max. 2 pages)

All activities funded under this solicitation must include biographical sketches for all key personnel. Biographical sketches are limited to two pages and formatting must comply with the most current Grant Proposal Guide. Biographical sketches should be sufficiently detailed to show that the necessary expertise is available to conduct the project.

Special Information/Supplementary Documentation:

Supplementary documentation is restricted to letters of commitment or collaboration, for example, letters from participating schools or advisory panel members. No appendices are allowed.

References

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

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

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

Press.

National Science Foundation (2005). *The mathematics education portfolio brief*, (NSF 05-03). Retrieved July 9, 2007 from http://www.nsf.gov/pubs/2005/nsf0503/nsf0503.pdf.

RAND Mathematics Study Panel (2003). *Mathematical proficiency for all students: Toward a strategic research and development program in mathematics education*. (MR-1643.0-OERI) Santa Monica, CA: RAND.

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.

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

B. Budgetary Information

Cost Sharing: Cost sharing is not required under this solicitation.

Budget Preparation Instructions:

A careful and realistic budget in accordance with the general guidelines contained in the NSF Grant Proposal Guide and consistent with the proposed activities of the project should be included. The estimated budget for the total amount of money requested from NSF, with information on salaries and other expenses, including but not limited to, equipment (where allowable), participants, consultants, travel, subawards, and indirect costs must be provided. The Budget Justification section should include a budget narrative that describes and validates each of the expenses, including the hourly rate and effort expected from each consultant. DR-K12 proposals generally do 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. In addition to the above budgetary items, the budget should include a request for funds to cover the cost of attendance of the Principal Investigator at each year's annual awardee meeting in the Washington, DC area.

C. Due Dates

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

  January 08, 2009

  January 07, 2010

Full Research and Development Projects, Exploratory Projects, and Synthesis Projects

D. FastLane / Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

  Detailed technical instructions regarding the technical aspects of preparation and submission via FastLane are 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.

  Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Website at: https://www.fastlane.nsf.gov/fastlane.jsp.

- **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. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: http://www.grants.gov/CustomerSupport. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding 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.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal preparation requirements. 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 who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with the 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.

A. NSF Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board (NSB)-approved merit review criteria: intellectual merit and the broader impacts of the proposed effort. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two NSB-approved merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which the reviewer is qualified to make judgements.

What is the intellectual merit of the proposed activity?
How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?
How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

Examples illustrating activities likely to demonstrate broader impacts are available electronically on the NSF website at: http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf.

NSF staff also will give careful consideration to the following in making funding decisions:

Integration of Research and Education
One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities
Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- 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.

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 formulate a recommendation to either support or decline each proposal. 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 is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, 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.

In all cases, 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 and 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.

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 letter, 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 letter; (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 letter. 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 pubs@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 before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after expiration of a grant, the PI also is required to submit a final project report.

Failure to provide the required annual or final project reports will delay NSF review and processing of any future funding increments as well as any pending proposals for that PI. 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 FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete.

The DR-K12 program is planning a program-wide monitoring process. Awardees may be expected to provide data for monitoring purposes.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Inquiries should be made to either, telephone: (703)292-8620, email: DRLDRK12@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, MyNSF (formerly the Custom News Service) 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 Regional 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. MyNSF also is available on NSF's Website at http://www.nsf.gov/mynsf/.

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

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 40,000 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 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: pubs@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
Division of Administrative Services
National Science Foundation
Arlington, VA 22230

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