Discovery Research K-12 (DR K-12)

Program Solicitation
NSF 10-610

Replaces Document(s):
NSF 09-602

National Science Foundation

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

Letter of Intent Due Date(s) ***(required)*** (due by 5 p.m. proposer's local time)***:***

November 05, 2010

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

January 06, 2011

IMPORTANT INFORMATION AND REVISION NOTES

The Discovery Research K-12 (DR K-12) program solicitation has been revised in order to clarify several aspects of the call for proposals. It includes a new challenge for development and testing of innovative instructional materials and a revised section on evaluation that clarifies expectations. It also explains the new requirement for submitting *Letters of Intent*, the NSF policy regarding salary compensation for senior project personnel, and the regulations about supplemental documents that can be submitted as part of a proposal.

Please be advised that the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) includes revised guidelines to implement the mentoring provisions of the America COMPETES Act (ACA) (Pub. L. No. 110-69, Aug. 9, 2007.) As specified in the ACA, each proposal that requests funding to support postdoctoral researchers must include a description of the mentoring activities that will be provided for such individuals. Proposals that do not comply with this requirement will be returned without review (See the PAPP Guide Part I: *Grant Proposal Guide* Chapter II for further information about the implementation of this requirement.)

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Discovery Research K-12 (DR K-12)

Synopsis of Program:

The Discovery Research K-12 (DR K-12) program seeks to enable significant advances in student and teacher learning of the STEM disciplines. Projects funded under this solicitation begin with a research question or hypothesis about how to improve preK-12 STEM learning and teaching and then develop, implement, and study effects of innovative educational resources, models, or technologies.

DR K-12 invites proposals that meet a variety of educational needs, from those that address immediate challenges facing preK-12 STEM education to those that anticipate the future when expectations, roles and resources are likely to be aligned in different ways. DR K-12 especially 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 support learning. Project goals, designs, and working strategies should be informed by prior research and practical experience drawn from all relevant disciplines and they should focus on concepts and skills that are central to STEM disciplines.

The DR K-12 program is primarily concerned with the goals and effectiveness of formal education, yet it recognizes that learning is not limited to traditional school sites and times. As appropriate, the program encourages projects to draw from knowledge and practice of learning in out-of-school and informal settings.

While many projects supported under this solicitation will focus on exploratory development and testing of innovative ideas for some specific facet of STEM education, all proposals must explain how the work can lead ultimately to successful adoption of findings or products in the preK-12 enterprise on a national scale.

NSF has created an agency-wide priority to fully capture the transformative potential of advanced learning technologies across the education enterprise. The intent is to catalyze new approaches to STEM learning by all and for workforce development, and to provide the pathways and resources to study the learning process itself. To address this mandate, the DR K-12 program has the more focused goal of fostering the creation of a new generation of resources, models, and tools that take full advantage of the capabilities of information and communications technologies to enhance the education of K-12 learners.

The DR K-12 program accepts proposals for exploratory projects, full research and development projects, and synthesis projects, as well as for conferences and workshops related to the mission of the program.

Cognizant Program Officer(s):

- Inquiries can be made to either, telephone: (703)292-8620, email: DRLDRK12@nsf.gov
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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: 53 to 75 per year. It is anticipated that about 20-25 Exploratory awards, 20-25 Full Research and Development awards, 3-5 Scale-up awards, 5-10 Synthesis awards, and 5-10 Conference/Workshop awards will be made in FY 2011, pending availability of funds.

Anticipated Funding Amount: $55,000,000 in FY 2011 for new awards made under this solicitation, pending availability of funds. Normal limits for funding requests of DR K-12 proposals are as follows: (1) Exploratory projects up to $450,000 with duration up to three years; (2) Full research and development projects up to $3,500,000 with duration up to five years; (3) Projects that study scale-up of STEM education innovations up to $5,000,000 with duration up to five years; (4) Synthesis projects up to $250,000 with duration up to two years; and (5) Conference/Workshop projects up to $100,000 for duration 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:** Submission of Letters of Intent is required. Please see the full text of this solicitation for further information.
- **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/publications/pub_summ.jsp?ods_key=grantsgovguide)

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

- **Letter of Intent Due Date(s) *(required)*** (due by 5 p.m. proposer's local time)***:***

  November 05, 2010

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

  January 06, 2011

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 emphasizes six themes in fulfilling this responsibility:

1. Furthering public understanding of science and advancing STEM literacy;
2. Broadening participation to improve workforce development;
3. Promoting learning through research and evaluation;
4. Promoting cyberlearning strategies to enhance STEM education;
5. Enriching the education of STEM teachers; and
6. Preparing scientists and engineers for tomorrow.

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). The DR K-12 program is managed in DRL.

The Division of Research on Learning in Formal and Informal Settings

DRL invests in projects to enhance STEM learning for people of all ages in both formal and informal learning settings. Its mission includes promoting innovative and transformative research and development, and evaluation of learning and teaching in all STEM disciplines. New and emerging areas of STEM must play prominent roles in efforts to improve STEM education. The integration of cutting-edge STEM content and the engagement of scientists, engineers, and educators from the range of disciplines represented at NSF is encouraged in all DRL initiatives. DRL's role is to be a catalyst for change by advancing theory, method, measurement, development, evaluation, and application in STEM education. The Division seeks to support both development of promising new ideas and large-scale implementation of proven educational innovations.

The Division's programs offer a set of complementary approaches for advancing research, development, and improvement of practice.

- The Discovery Research K-12 (DR K-12) program enables significant advances in preK-12 and teacher learning of the STEM disciplines through research and development on innovative resources, models, and technologies for use by students, teachers, administrators and policy makers.
- The Informal Science Education (ISE) program supports innovation in anywhere, anytime, lifelong learning, through

investments in research, development, infrastructure and capacity-building for STEM learning outside formal school settings.

- The Innovative Technology Experiences for Students and Teachers (ITEST) program invests in projects designed to address the growing demand for professional and information technology workers through the design, implementation, scale-up, and testing of technology-intensive educational experiences for students and teachers, and through related research studies.
- The Research and Evaluation on Education in Science and Engineering (REESE) program advances research at the frontiers of STEM learning, education, and evaluation, in order to provide foundational knowledge for improving STEM teaching and learning at all educational levels and in all settings.

Each of these programs is intended to improve their field's capacity 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 (NSF, 2006).

DRL and Innovation

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 research and development (see Figure 1) that forms the conceptual framework for its programs (adapted from American Statistical Association, 2007; NSF, 2005; RAND, 2003). All DRL programs are concerned with all five components of the cycle, to different degrees.

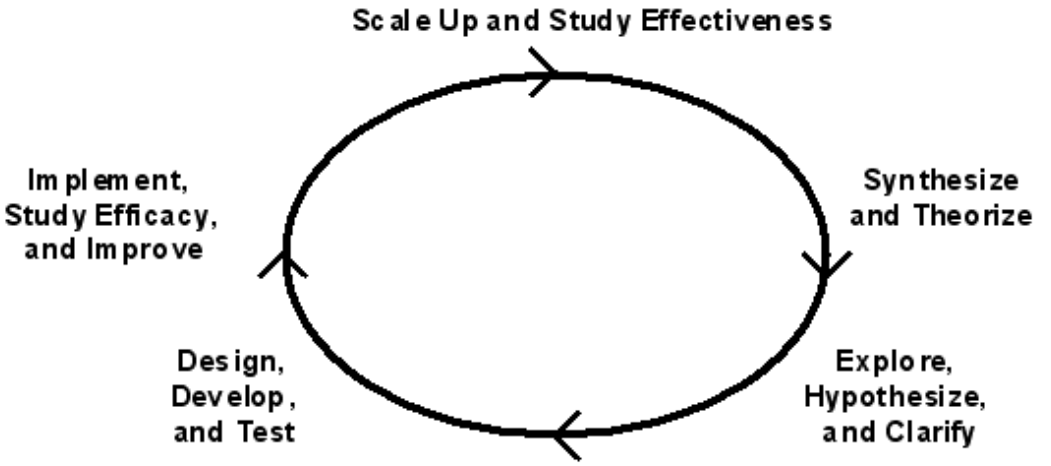

Figure 1: Cycle of Research and Development

Each part of the cycle forms the vital and compelling foundation for transition to the next part of the cycle. The research, development, implementation and evaluation activities need to be appropriately rigorous. Projects funded by DRL are providing the ideas, resources, and human capacity to advance STEM learning and education in the 21st century:

- Challenging the STEM education and research communities with transformative ideas
- Conducting the pioneering and pragmatic research necessary to advance STEM learning
- Developing and studying world-class learning resources for teachers, students, and the public
- Addressing workforce needs through the design and study of technology-intensive educational experiences.

The major distinction between the DR K-12 and REESE programs is that DR K-12 projects focus on development and study of specific resources, models and technologies designed to improve STEM education in preK-12 schools, while REESE projects focus primarily on building theory and knowledge about STEM education across learning contexts and ages. The outcomes of DR K-12 projects will be STEM education innovations that are informed by research and tested in practice. The primary outcomes of REESE projects will be research findings, methods, and theoretical perspectives about STEM education. Proposers who are in doubt about the appropriate program for funding of their work should consult an NSF program officer.

II. PROGRAM DESCRIPTION

The goal of the DR K-12 program is to enable significant advances in preK-12 student and teacher learning of the STEM disciplines through development, implementation, and study of resources, models and technologies that eventually can and will be used effectively in many sites and circumstances across the nation.

- **Resources** include instructional and assessment materials for students and teachers, and they may come in print, multi-media, networked, or virtual forms.
- **Models** include curricular frameworks and learning progressions, teacher education and professional development program designs, academic standards, and other guides for learning and teaching.

- **Technologies** include tools for cyberlearning such as computer software, labware, networking and collaboration utilities, web-based resources, on--line gaming, virtual learning environments, and portable digital media as well as scientific tools like sensors for data capture or laboratory studies.

The DR K-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. 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 relatively near term, albeit in highly innovative 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 challenge existing assumptions about STEM learning and teaching. Such projects might envision transforming educational systems so that they (1) are dramatically more effective with the diversity of learners they will serve; (2) support STEM learning with collaborative and interactive tools for cyberlearning; (3) help students and teachers draw on the expertise and resources of scientists and practitioners located far from the classroom or teacher education setting; or (4) link in-school and out-of-school STEM learning in imaginative new ways.

DR K-12 accepts proposals for exploratory projects, full research and development projects, synthesis projects, and conferences/workshops. The design of any DR K-12 project begins with a reasonable evidence-based hypothesis about how some aspect of STEM education can be improved. The proposal then offers a plan for developing and/or studying impact of the suggested innovation in STEM learning and teaching. The proposal should articulate clear goals for the project and a plan of work that describes research and development strategies appropriate for attaining its goals. Projects focused at different stages in the DRL cycle of research and development will naturally choose different development and implementation strategies and different research and project evaluation methods. There is no expectation that a single project of 3-5 years duration should try to include early design/develop/test work as well as efficacy and scale-up studies .

Abstracts of current DRL projects can be found here. In addition, a searchable database of the DR K-12 portfolio is available at www.cadrek12.org.

A. DR K-12 Program Challenges

The DR K-12 program aims to fund a portfolio of projects that build knowledge of effective practice in STEM education assessment, curriculum, instruction, teacher preparation, teacher professional development, and implementation of innovations. The program is primarily concerned with improving education of students and supporting the work of teachers in formal school settings. However, projects are also encouraged to explore opportunities for informal STEM learning experiences to enhance the core STEM education provided by schools.

While many projects supported under this solicitation will focus on exploratory development and testing of innovative ideas for some specific facet of STEM education, all proposals must explain how their work can lead ultimately to successful adoption of findings or products in the preK-12 enterprise at a scale beyond that directly supported by the grant. In particular, the program seeks proposals that address one or more of the following key challenges in preK-12 STEM education.

1. How can enhanced assessments of student knowledge and skills advance preK-12 STEM teaching and learning?

In an era of increased accountability in preK-12 education, resources, models and technologies for assessing STEM content knowledge and habits of mind must keep pace with and anticipate the demands of instruction and educational policy. Among the most pressing issues is the alignment of preK-12 assessments with the learning goals represented in widely used standards documents and held by teachers and policy makers. It is important that formative and high stakes summative assessments of STEM learning probe student achievement of the most important disciplinary content-concepts, principles, skills, and reasoning -- and the application of that knowledge to problem solving and decision-making.

DR K-12 is interested in supporting the development and study of innovations in (1) summative assessment of student and teacher content knowledge, attitudes, beliefs, motivation, aptitudes, creativity and other important objectives of STEM education; (2) formative assessment of student progress in learning STEM concepts and processes; and (3) strategies for using information from both formative and summative assessments to enhance teaching and learning. Proposals for development and study of innovative strategies for using cyberlearning tools in assessment are of particular interest to the DR K-12 program. Analyses of existing assessment tools or frameworks, comparison of effects from use of different assessment approaches, and syntheses of relevant research to help assessment developers and policy makers are also eligible for support.

Assessing the full scope of mathematical, scientific, and technological proficiency in valid and reliable ways presents conceptual, psychometric, and practical challenges. Thus, in all assessment projects, interdisciplinary collaborations with psychometricians and STEM disciplinary experts are expected.

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

The DR K-12 program seeks proposals to develop and study innovative resources, models, and technologies for teaching and learning that can increase the nation's capacity to provide more students with access to the most important foundational and emerging concepts and processes of STEM disciplines. The program especially encourages proposals for projects that (1) prepare students to understand and apply increasingly sophisticated content in STEM subjects; (2) develop the big ideas needed to understand

important interdisciplinary subjects like climate change, environmental sustainability, or energy options, (3) help students learn STEM practices, modes of inquiry, and engineering design through hands-on and virtual laboratory experiences; (4) provide substantive STEM learning activities that effectively serve the diversity of learners found in contemporary U. S. classrooms; and (5) address the STEM education needs of career and technical education students. Proposals to do this work must explain how their ideas will help students to develop a coherent and progressively more sophisticated understanding of STEM content and of the ways that new ideas are investigated and knowledge is generated.

The now pervasive access to networked computing and communication tools and the information resources of the internet have created exciting new possibilities for STEM instructional materials. To develop and test the potentially transformative effects of these resources, DR K-12 encourages proposals to create and study innovative forms of instructional materials like interactive digital textbooks, exploratory virtual environments and simulations, visualization tools, virtual scientific instruments, and other ways to support instruction that transcends the limitations imposed by traditional classrooms. Projects might also explore the characteristics that make innovative instructional materials and technologies effective -- for example, the effects of different formats for representation of STEM content, the effects of using contexts for motivating and facilitating learning of abstract ideas, or the power of new cyberlearning environments like simulations and games.

In development and study of innovative resources, models and technologies to enhance student learning, projects are urged to build interdisciplinary collaborations with researchers in the STEM disciplines, the learning sciences, and other disciplines. Syntheses of prior work on key questions will also contribute valuable insights to research and development projects and to curricular and instructional decision-making by STEM education practitioners and policymakers. Thus proposals for such synthesis projects are also welcome.

3. How can we enhance the ability of teachers to provide high quality STEM education for all students?

The DR K-12 program recognizes that a well-prepared and well-supported teacher workforce is crucial to excellent preK-12 STEM education. Thus the program seeks proposals to study existing programs and develop innovative models that support learning by preK-12 teachers at all points in their careers. For example, projects in this area might develop and study (1) innovative programs to recruit, certify, induct, and retain STEM teachers; (2) new strategies for helping pre- and in-service teachers develop content and pedagogical knowledge and skills; or (3) innovative strategies for sharing teaching expertise within schools and districts and across the broader national teacher community. As with all DR K-12 projects, these should build on an explicit theory of action with well-specified components and use strong research designs to assess impact.

Teachers today have unprecedented access to and experience with communication, information, and learning technologies that facilitate social networking, virtual gaming, scientific data analysis, and collaborations with scientists. The challenge in teacher preparation and professional development is in applying this access to information and expertise to the professional work of teaching. Thus the DR K-12 program is *especially interested* in supporting projects that anticipate professional learning options and needs of teachers who work in a global environment with powerful cyber infrastructure. Projects addressing this challenge should seek understanding of ways that pre-service and in-service teachers can acquire the skills, knowledge, and confidence they will need to teach in a world with rapidly changing technologies and STEM content.

Technology-enhanced resources and models to be developed and studied by DR K-12 teacher education projects might include (1) just-in-time online courses or digital library repositories and ways of using web-resources for teaching; (2) models for teacher networking and collaboration and tools to allow productive communication with peers, mentors, parents, and experts around the world; (3) tools that provide teachers with multi-dimensional diagnostic information about students; (4) teacher self-assessment tools; or (5) models of teacher education that impact the STEM learning of students. Synthesis projects that bring together findings on current technology--enhanced resources and models to identify new directions for research and development are also encouraged.

4. How are effective innovations successfully implemented, scaled, and sustained 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 outcomes in a small number of sites under carefully controlled conditions. The challenge is identifying conditions under which such promising innovations can be successfully implemented and sustained in a broad range of schools and districts across the country. Studies addressing this challenge should seek to understand how innovative resources, models, or technologies can be implemented and scaled up in increasingly varied sites and/or the factors that influence implementation and sustainability of innovations. The resources, models or technologies studied in such scale-up research may include work supported by NSF or by other public and private groups.

***Studies of impact at large scale*:** One type of needed scale-up study examines whether effects of specific STEM education interventions found in smaller scale efficacy studies are sustained when the innovation is implemented in a large number of classes, schools, or other situations and under normal adoption and implementation conditions for schools or districts. These research projects should be designed to include a variety of sites selected to allow broadly generalizable results.

Because a scale-up study generally aims to attribute improvements in STEM education practice and/or results to an intervention, the research designs must involve an adequate number of individuals, classes, or schools, and give careful attention to measures of fidelity and adaptations when the intervention is implemented. Effectiveness of the innovation should be assessed by appropriate, valid, and reliable instruments. Experimental studies with random assignment to treatment are encouraged. Longitudinal studies of student achievement may be appropriate for studies of impact at large scale, and analysis of disaggregated data is often useful for informing stakeholders about the intervention's impact on diverse student groups.

***Studies of organization and scale*:** Another type of needed scale-up study examines how a specific new resource, model, or technology is implemented, institutionalized, and sustained with the aim of understanding the organizational elements necessary for implementing the innovation successfully. Research questions for such studies might focus on implementation factors like (1) school or district financial investments, leadership, and organizational practices; (2) feasibility and fidelity of classroom implementation; (3) teacher professional development in support of the innovation; (4) engagement of teachers, administrators, and community representatives in adoption and implementation decisions; and/or (5) policy issues such as the innovation's alignment with state standards or assessments. Studies of the implementation and scale-up process might employ qualitative, quantitative, or mixed research methods to document, analyze, and interpret relationships between critical implementation factors and outcomes.

Proposals for either kind of implementation and scale-up study must provide sufficient evidence that prior research on the resource, model, or technology being studied has provided efficacy data showing positive impact on student or teacher learning under specific conditions. Results of previous rigorous experimental or quasi-experimental studies or meta-analysis of related studies might provide such evidence of efficacy.

5. How can next-generation, cyber-enabled learning materials radically transform students' STEM learning experiences and enhance their abilities and interests in STEM fields?

The DR K-12 program seeks proposals for creation of a new generation of learning materials that take full advantage of the capabilities of information technology, build upon what is known about learning in digital environments, and subscribe to a bold vision for the future of STEM education. Incremental advancements such as digitizing textbooks, embedding assessments, or providing web links to supplementary materials could be supported under one or more of the previous four challenges. This challenge invites proposals for development and research that goes substantially beyond what is easily done or readily adopted. It is for projects that deeply imbed technologies in learning environments and examine what is possible if the constraints of pedagogical tradition, educational policies, and limited resources are ameliorated by application of powerful and pervasive technologies and media.

Most young people and STEM professionals now use powerful technologies in the activities of their everyday lives. Yet the use of technology in formal education has lagged far behind that standard. Without a vigorous program of innovative research and development, the gap between the experience of STEM education and life outside of school is certain to increase. Education practitioners and policymakers want and need proven examples of successful innovations and convincing predictions about future developments before committing to a path of radical reform in curriculum, teaching, and assessment practice. Thus STEM education needs a new generation of learning models and resources to serve as examples of what is possible-models and resources that incorporate innovative instructional materials for students and teachers, new kinds of learning assessments, and tools for collaboration, planning, and reflection by both students and teachers.

STEM learning materials are needed that motivate and engage learners in deep and meaningful study within a coherent curriculum; that are dynamic, responsive, and adaptable to support the wide range of interests, abilities, languages and cultures in modern classrooms; and that monitor activity and learning closely in order to provide appropriate and timely assistance to individual students and teachers. New models for STEM learning should scaffold the development of core knowledge, skills, and ways of thinking, but also encourage individual exploration that goes beyond narrowly defined content standards. They should be highly interactive, adaptable, and easily expandable. They could include immersive environments that allow students to experience the challenges and activities of various STEM roles. They should provide tools to help learners organize, assess, and reflect on their work, and to collaborate, share, and engage in scientific discourse with other students, educators, and STEM experts. They should provide ways of learning and doing that are personally sustainable, preparing young people to be lifelong learners who are facile with cutting-edge technologies and can learn and adapt to a rapidly changing world both in and out of work.

Proposals that respond to the challenge of designing, developing, and testing the next generation of STEM learning materials could be submitted as exploratory or full research and development efforts. While some projects might develop and test key components of larger innovations, others might tackle the challenge of developing and studying models for comprehensive STEM learning environments. For larger, comprehensive efforts, development might take many years and a succession of projects before fully adoptable materials are completed. In that case, the first project should be viewed as building the case for subsequent work.

Although primarily intended to support development and testing of innovative learning materials, this challenge also invites research projects studying the consequences of such innovations. For example, it is likely that new kinds of educational materials will substantially alter the traditional roles of learners, teachers, and instructional resources in the learning environment. The responsibilities for meeting the goals of formal education will undoubtedly shift to include a broader community of stakeholders, such as informal institutions, STEM professionals, parents and caregivers. And the new learning environments can be

expected to yield some new kinds of outcomes for students.

B. Additional Program Information Applicable to Proposal Types

The DR K-12 program invites proposals for four types of projects: exploratory projects, full research and development projects, synthesis projects, and conferences/workshops.

Exploratory projects allow researchers and developers an opportunity to undertake preliminary work needed to clarify constructs, assemble theoretical or conceptual foundations, or perform early investigations of an idea for an innovative resource, model, or technology. They might develop that idea into prototype educational materials or practices and conduct research in small scale pilot tests to provide proof of concept and preliminary estimates of impact. These explorations could produce empirical evidence forming the basis of anticipated further research and development work.

Exploratory projects may be of interest to researchers seeking modest funding to launch an innovation or an intriguing novel line of research. They can be used to build a research agenda, establish its potential value, and introduce the views and work of a new research team to the field.

Full research and development projects typically focus their work at one of three points on the cycle of research and development illustrated in Figure 1.

A project whose goal is to ***design, develop, and test*** innovative curriculum materials, technologies, teaching methods, models for teacher preparation or professional development, or assessment tools for an aspect of STEM education might reasonably choose a *design research* strategy to develop and improve its approach through iterative pilot tests (Clements, 2007; Cobb et al., 2003; Lamberg and Middleton, 2009). The project research questions and methods should focus on systematic monitoring of teachers' and students' responses to the innovation in order to inform the development process. Project evaluation activities should document ways that evidence from pilot tests is used to refine the approach.

A project whose goal is to ***implement, study efficacy, and improve*** innovative curriculum materials, teaching methods, assessments, technologies, or models for teacher professional development will test its theory of action in a larger number of classrooms, schools, or sites using quasi-experimental or experimental research designs that allow causal inference. Efficacy is defined as how well an intervention works when it is implemented under ideal conditions (Shadish, Cook, and Campbell, 2002, p. 507). The goal of work at this stage in the cycle of research and development is to test the new resource, model, or technology under conditions consistent with its theory of action. Results of these tests may provide strong evidence about what can be expected from the innovation when well-implemented, as well as clarify aspects of implementation that are crucial to obtaining desired outcomes. Efficacy studies require appropriate research designs with power analysis to determine sample sizes required to have sufficient probability for detecting treatment effects. Such studies in STEM education commonly employ multi-level modeling to describe both class- and student-level effects of innovations. However, informative efficacy studies might also have strong qualitative research components to illuminate how, why, and for whom the innovation works.

If an efficacy study of a STEM education innovation shows that its implementation is feasible and produces large and consistent effect sizes, then testing should move to the ***scale-up and study effectiveness*** stage in the cycle of research and development. Effectiveness is defined as how well an intervention works when it is implemented under common conditions of application (Shadish, Cook, and Campbell, 2002, p. 507). Tests at this stage involve implementation in a greater variety of settings and under conditions that would be typical for many classrooms, schools, systems, or teacher education and professional development programs. Research designs appropriate for scale-up studies could include experimental or quasi-experimental designs that allow causal inference and document the innovation's impact at progressively larger scale and in more varied contexts. The goal of data collection and analysis in effectiveness studies is to determine whether broad implementation of the innovative curriculum, teaching method, assessment, or teacher preparation/professional development strategy is warranted. Such studies should also provide insights into conditions and practices that will make that implementation successful.

Many factors affect whether an educational innovation is actually taken up and broadly used to improve student and/or teacher outcomes. The field of STEM education needs to know more about conditions and contexts that permit an intervention to go to scale and have sustained positive effects. Thus the DR K-12 program is also interested in studies aimed at developing and testing a theory of action for scale-up of innovations.

All proposed projects, regardless of location in the cycle of research and development, should have clearly defined deliverable products and plans for dissemination of findings. The deliverables and dissemination strategies will, of course, differ for projects at different points in the cycle.

Synthesis projects are small grants for the survey and analysis of existing knowledge on a topic of critical importance to preK-12 STEM education. Synthesis proposals should identify questions of importance to education research and development, identify areas where the knowledge base is sufficiently robust to support strong scientific claims, 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, the audience for the findings, and forums for dissemination of results. Workshops and other meetings may be included as part of the synthesis process.

Conferences and workshops related to the mission of the DR K-12 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 Proposal and Award Policies and Procedures Guide/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 to be conducted at least 12 months after the conference is completed.

References

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III. AWARD INFORMATION

The requested funds and the duration of any DR K-12 project should be commensurate with the task and the importance of the project in answering key questions or providing important resources to the nation. Normal limits for funding requests of DR K-12 proposals are as follows: (1) Exploratory projects up to $450,000 with duration up to three years; (2) Full research and development projects up to $3,500,000 with duration up to five years; (3) Projects that study scale-up of STEM education innovations up to $5,000,000 with duration up to five years; (4) Synthesis projects up to $250,000 with duration up to two years; and (5) Conference/Workshop projects up to $100,000 for duration 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

Letters of Intent *(required):*

Specify the challenge that the proposal addresses, the tentative project title, the principal investigators, and the organizations involved.

Letters of Intent must be submitted via the NSF FastLane system, using the Letter of Intent module in FastLane, for all DR K-12 proposals except conferences.

Letters of Intent are limited to 2,500 characters, including spaces (approximately 350 words). Your Letter of Intent should contain a brief narrative that describes the project and provides the following information: (1) a project title; (2) clear identification of the primary Challenge to which it is submitted (1-5); (3) a list of proposed Principal Investigators and Co-Principal Investigators, including organizational affiliations and departments; (4) partnering institutions; (5) STEM disciplines represented.

Letter of Intent Preparation Instructions:

When submitting a Letter of Intent through FastLane in response to this Program Solicitation please note the conditions outlined below:

- Sponsored Projects Office (SPO) Submission is not required when submitting Letters of Intent
- Submission of multiple Letters of Intent is allowed

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.4 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 DR K-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 DR K-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. The first sentence of the Project Summary should specify the type of proposal (e.g., exploratory, full research and development, synthesis) and the challenge addressed. When appropriate, the second sentence should state the discipline being addressed and identify the audience for the project. 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 K-12 solicitation must address the following elements in the 15-page project description:

1. Goals and purpose

Proposals of all types (Exploratory, Full Research and Development, Synthesis, 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 described above. The proposal should provide a rationale for how the project will improve STEM education for students and/or teachers and advance knowledge, and it should explain how products or findings might ultimately be implemented in schools on a large scale.

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. 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 evaluations that provide compelling evidence of the quality and effectiveness of the resources, models and technologies developed. How the prior work influences this proposal should be discussed as part of the description of the project.

3. Research and Development Design

The design of any DR K-12 project begins with a hypothesis about how some aspect of STEM education can be improved. The proposal then offers a plan for developing an innovative resource, model, or technology and studying the innovation's impact on STEM learning and teaching. The proposal should articulate a plan of work that describes research and development strategies appropriate for attaining its goals. *Projects focused at different stages in the DRL cycle of research and development will naturally choose different development strategies and different research and evaluation methods.*

4. Evaluation

All DR K-12 proposals must have a plan for formative and summative evaluation of project research and development work. The evaluation should focus on the validation of, fidelity to, and the usefulness of the development and research processes to achieve the targeted outcomes. The objectives of the evaluation include (1) ensuring that the project is making satisfactory progress toward its goals; (2) recommending reasonable, evidenced-based adjustments to project plans; (3) determining the value of the outcomes of the project; and (4) attesting to the integrity of outcomes reported by the project. Proposals should describe the main features of the evaluation design -- the evaluation questions, the data to be gathered, the data analysis plans, and the expertise of the investigators who will be responsible for the work. Each proposal should clearly distinguish between the role of the evaluation effort and that of other critical product and/or research components.

Formative evaluation serves primarily to provide timely feedback to the development and research team. At a minimum the formative evaluation should validate that the project activities are guided by a reasonable theory of action, are of high quality, are on schedule, and are likely to result in the attainment of the broad goals and objectives of the project. The evaluation plan should explain how appropriate feedback will be given to the project leadership so that it can make timely modifications to the project activities and address

significant issues.

Summative evaluation must be conducted by capable professionals who are external to the development and research team(s) and usually external to the team's institutions. The summative evaluation substantiates that the project has collected credible evidence to answer its research questions and hypotheses and/or justify its claims and reports on threats to the internal and external validity of the research findings. Although the project development and research teams might conduct the majority of the data gathering, analysis and interpretation as part of the core work of the project, the evaluator would use their work and other data to evaluate success of that work in meeting project objectives. The summative evaluation must be submitted as part of the final project report.

The type and extent of the evaluation may vary by type of project (exploratory, full research and development, or synthesis) and the monetary level of the award.

For an exploratory project, the evaluation functions should be performed by a capable individual or an advisory board with independence from the project. The evaluation

should analyze progress of the project, suggest ways to improve project operations, check the validity of project research findings and interpretations, and/or gauge the quality of the resources, models, or technologies being developed.

For full research and development projects that aim to address larger issues in more depth and have a larger budget, the evaluation must have plans for both formative and summative evaluations. The evaluators may be the same or different for each type of evaluation but must be sufficiently distant from the project to assure confidence in the objectivity of the evaluation. For such projects that involve a complex intervention, the evaluation capacity might need to be expanded to include an expert advisory board to evaluate the project and advise the research team.

5. Dissemination

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

6. Expertise

DR K-12 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. **Each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. The mentoring plan must not exceed one page.**

In addition, all resources, models and technologies developed by DR K-12 projects must be reviewed by qualified experts in relevant STEM disciplines (e.g., scientists, mathematicians, engineers), and in STEM pedagogy. This may be done by an advisory committee with appropriate expertise whose members may be from the same or different institutions as 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 each 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 three document types. A statement about mentoring of post-doctoral associates is required if the project includes post-doctoral associates. Letters of commitment or collaboration -- for example, letters from participating schools or advisory panel members, and a one-page list of staff, affiliations and partner institutions are highly recommended. **Proposals with other material will be returned without review.**

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 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, sub-awards, 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 K-12 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.

Please note that as a general policy, NSF limits salary compensation for senior project personnel to no more than two months of their regular salary in any one year. This limit includes salary compensation received from all NSF-funded grants. If the current and pending support documents for a proposal show individual senior personnel with more than 2 months of annual compensation expected, an explanation must be provided in the budget justification.

C. Due Dates

- **Letter of Intent Due Date(s)** ***(required)*** (due by 5 p.m. proposer's local time)***:***

  November 05, 2010

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

  January 06, 2011

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

Mentoring activities provided to postdoctoral researchers supported on the project, as described in a one-page supplementary document, will be evaluated under the Broader Impacts criterion.

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 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 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, 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 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 project outcomes report 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.

The DR K-12 program has 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 can be made to either, telephone: (703)292-8620, email: DRLDRK12@nsf.gov
- John (Spud) Bradley, telephone: (703) 292-5091, email: jbradley@nsf.gov
- Jinfa Cai, telephone: (703) 292-8620, email: jcai@nsf.gov

- David B Campbell, telephone: (703) 292-5093, email: dcampbel@nsf.gov
- Julia V. Clark, telephone: (703) 292-5119, email: jclark@nsf.gov
- Robert E. Gibbs, telephone: (703) 292-5122, email: rgibbs@nsf.gov
- James E. Hamos, telephone: (703) 292-4687, email: jhamos@nsf.gov
- Michael R. Haney, telephone: (703) 292-5102, email: mhaney@nsf.gov
- Julio E. Lopez-Ferrao, telephone: (703) 292-5183, email:jlopezfe@nsf.gov
- Nafeesa Owens, telephone: (703) 292-2995, email: nowens@nsf.gov
- Joseph Reed, telephone: (703) 292-5187, email: jreed@nsf.gov
- Gerhard L. Salinger, telephone: (703) 292-5116, email: gsalinge@nsf.gov
- Hannah Sevian, telephone: (703) 292-5108, email: hsevian@nsf.gov
- Elizabeth VanderPutten, telephone: (703) 292-5147, email: evanderp@nsf.gov
- Darryl N. Williams, telephone: (703) 292-7906, email: dnwillia@nsf.gov
- Patricia S. Wilson, telephone: (703) 292-5096, email: pwilson@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, National Science Foundation Update is a free e-mail subscription service 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 when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the NSF web site .

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

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