STEM-C Partnerships: MSP (STEM-CP: MSP)

PROGRAM SOLICITATION
NSF 14-522

REPLACES DOCUMENT(S):
NSF 12-518

National Science Foundation

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

Directorate for Computer & Information Science & Engineering

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

   March 18, 2014

IMPORTANT INFORMATION AND REVISION NOTES

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

The *Guidelines* publication can be found on the NSF website with the number NSF 13-126 (http://www.nsf.gov/pubs/2013/nsf13126/nsf13126.pdf). A set of FAQs regarding the *Guidelines* is available with the number NSF13-127(http://www.nsf.gov/pubs/2013/nsf13127/nsf13127.pdf). Grant proposal writers and PIs are encouraged to familiarize themselves with both documents and use the information therein to help in the preparation of proposals to NSF.

Revisions to this Solicitation from earlier ones of the Math and Science Partnership Program

1. The STEM-C Partnerships program consolidates and advances the efforts of the Math and Science Partnership (MSP) and the Computing Education for the 21st Century (CE21) programs.

2. The STEM-C Partnerships: MSP solicitation includes an emphasis on computer science education but persists in prior MSP efforts encouraging innovative proposals to improve K-12 education in any of the natural sciences, engineering, mathematics, or computer science, as well as interdisciplinary approaches.

3. The categories of eligible proposers are expanded from the previous MSP solicitation.

4. Minimal requirements for the composition of the Partnership have changed; inclusion of at least one K-12 school district persists, but the other Core Partner requirement has altered to at least one institution/organization that is actively engaged in teacher education (pre-service and/or in-service).

5. Only one type of funding track -Targeted Partnerships- from the MSP program persists.

6. This solicitation maintains the previous four focal areas within Targeted Partnership proposals and adds a fifth focal area, Teaching and Learning in Computer Science.

7. A new funding track in this solicitation is STEM-C Partnerships Computer Science Education Expansion which is open only to NSF MSP Partnerships that have been previously funded to work at the high school level; funding is up to $500K and will be provided through supplements to current MSP awardees or grants to previous NSF funded MSP Partnerships.

8. In this solicitation, the maximum amount for a Targeted Implementation project has been reduced to $7.5 million for project duration of up to 5 years.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

   STEM-C Partnerships: MSP (STEM-CP: MSP)

Synopsis of Program:

The STEM-C (Science, Technology, Engineering and Mathematics, including Computing) Partnerships program is a major research and development effort of two NSF Directorates, the Directorate for Education and Human Resources and the Directorate for Computer and Information Science and Engineering, which supports innovative partnerships to improve teaching and learning in science, technology, engineering, and mathematics (STEM) disciplines. STEM-C Partnerships combines and advances the efforts of both the former Math and Science Partnership (MSP) and the former Computing Education for the 21st Century (CE21) programs. It is critical that our nation maintain a competent, competitive and creative STEM workforce, including teachers. Therefore, NSF aims to inspire and motivate the next generation of that workforce, while ensuring that it has the skills, competencies, and preparation to be successful. As we transition to a global, knowledge-based economy that is often driven by information technology and innovation, it is increasingly important that STEM workforce preparation includes a strong foundation in computing. Thus, the STEM-C Partnerships program addresses both the need for advances in K-12 STEM education generally, as well as the need to elevate the inclusion of computer science education.

From MSP, STEM-C Partnerships embraces any of the STEM disciplines --within the natural science, mathematics, engineering, or computer science -- and maintains its commitment to institutional partnerships and opportunities for funding of Targeted proposals in one of four focal areas: Community Enterprise for STEM Teaching and Learning, Current Issues Related to STEM Content, Identifying and Cultivating Exceptional Talent, and K-12 STEM Teacher Preparation. From CE21, STEM-C Partnerships adds a discipline-specific focal area on the teaching and learning of computing and computational thinking, a strong commitment to broadening participation in computing, an emphasis on in-service teacher professional development, and support for the implementation of computer science courses at the high school level. It is expected that the merging of the MSP and CE21 programs will strengthen both and serve as a model for future incorporation of discipline-specific concerns into programs focused more broadly on STEM.

The STEM-C Partnerships program supports Partnerships that promote effective K-12 STEM education, building knowledge of teaching and learning in ways that deepen understanding and stimulate further exploration of STEM education in both in- and out-of-school settings. The Partnerships' cross-disciplinary teams call upon the expertise and research perspectives of learning scientists, including cognitive scientists, educational, developmental and social psychologists, social scientists and education researchers, as well as STEM, discipline-specific teachers, faculty, researchers, and scientists. The Partnerships provide the context and environment for the effective preparation, professional development, and ongoing support of K-12 teachers. Changes at the undergraduate level related to the preparation of K-12 STEM teachers are an implicit expectation of the work; in this way, the STEM-C Partnerships is a K-16 endeavor. Projects are encouraged to look at scalable models of effective learning and professional development mediated, perhaps, by evolving computational devices and advances in cyberinfrastructure, as well as ongoing developments in models, resources, tools, and their applications to learning, content, delivery, and pedagogy. The program supports transformative research and its use by varied research, development, and implementation communities. The needs of a particular Partnership related to advancing the teaching and learning of any of the STEM disciplines at the K-12 level should drive the focus of the Partnership's work. The inclusion of computer science, computational thinking, computational science **or** computing in K-12 STEM instruction is welcome, but not required.

All STEM-C Partnerships projects serve as models that have a sufficiently strong evidence/research base to improve STEM education outcomes for all students. The STEM-C Partnerships program requires institutional commitment to evidence-based teaching and learning which improves the achievement of all students studying STEM, with particular attention to educational practices that are effective for groups underrepresented in STEM-women, minorities (African-Americans, Hispanics, Native Americans, Alaska Natives, Native Hawaiians and other Pacific Islander territories), and students with disabilities. Through this solicitation, NSF seeks to support both **STEM-C Partnerships Targeted** awards and **STEM-C Partnerships Computer Science Education Expansion** awards. The **Targeted Partnerships** are supported at two funding levels (Implementation and Prototype) and are open to innovative Partnerships composed minimally of at least two Core Partners, a K-12 School District and an institution that brings disciplinary expertise in the natural sciences, mathematics, engineering and/or computer science and is actively engaged in the production of STEM teachers. STEM-C Partnerships Targeted awards may focus on any field of mathematics, or the natural sciences, or engineering, or computer science at the K-12 level. Targeted Prototype awards explore potentially innovative approaches and strategies in education. Targeted Implementation awards are intended to develop and put into practice innovative approaches and strategies in education. Both types of Partnerships incorporate significant new innovations to STEM education, linked to a strong educational research agenda, in one of five focal areas described below.

The **STEM-C Partnerships Computer Science Education Expansion** awards are open only to NSF MSP Partnerships that have been previously funded to work at the high school level and who seek to expand their work to increase the number of qualified computer science teachers and the number of high schools with rigorous computer science courses incorporated into the academic program.

Cognizant Program Officer(s):

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

- Kathleen B. Bergin, telephone: (703) 292-5171, email: kbergin@nsf.gov

- Janice Cuny, telephone: (703) 292-8900, email: jcuny@nsf.gov

- Arlene M. de Strulle, telephone: (703) 292-8620, email: adestrul@nsf.gov

- Valerie Barr, telephone: (703) 292-7855, email: vbarr@nsf.gov

- John Haddock, telephone: (703) 292-4643, email: jhaddock@nsf.gov

- Christopher Hoadley, telephone: (703) 292-7906, email: choadley@nsf.gov

- Michael Jacobson, telephone: (703) 292-4641, email: mjacobso@nsf.gov

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

- 47.070 --- Computer and Information Science and Engineering

- 47.076 --- Education and Human Resources

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 14 to 22

For FY2014, NSF expects to make an estimated 10-14 total Targeted Partnership awards, including 5-7 Implementation awards and 5-7 Prototype awards. An additional 4-8 STEM-C Computer Science Education Expansion awards (as grants or supplements) may also be funded in FY2014.

Anticipated Funding Amount: $57,080,000

Approximately $57.08 million for new awards and continuing awards in FY2014; pending the availability of funds.

TARGETED PARTNERSHIPS: The maximum total budget for a Targeted Partnership that is a Prototype project is $1,500,000 (average annual budgets of $500,000) with a duration of up to 3 years. The maximum total budget for a Targeted Partnership that is an Implementation project is $7,500,000 (average annual budgets of $1,500,000) with a duration of up to 5 years. Targeted Partnerships awards will be made as standard or continuing grants. Funds requested must directly correlate with the scope and complexity of the proposed work as well as with the number of teachers and/or students engaged in or impacted by the project. As NSF is interested in models of varying scales and scope, but still with national significance, requests for funding of lesser amounts are encouraged. The budget should be commensurate with the scale and scope of the proposed work.

Computer Science Education Expansion (CSE-Expansion): The maximum total budget for a CSE-Expansion award is $500,000 with a duration of up to three years. Two mechanisms for funding are standard grants or supplements. NSF MSP Partnerships that have been previously funded to work at the high school level will be eligible for funding through standard grant awards, while current NSF MSP awardees working at the high school level will be eligible for funding through supplements.

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- State and Local Governments: State educational offices or organizations and local school districts.

Who May Serve as PI:

There is no eligibility requirement for the Principal Investigator of a Targeted Partnership proposal or a STEM-C Partnerships Computer Science Education Expansion proposal. The Partnerships will include cross-disciplinary teams that call upon the expertise and research perspectives of learning scientists, including cognitive scientists, educational, developmental and social psychologists, social scientists and education researchers, as well as STEM discipline-specific teachers, faculty, researchers, and scientists. Therefore, the team of the Principal Investigator and co-Principal Investigators for a Partnership must include individuals who represent the various fields that are the focus of study, including a K-12 Core Partner organizational representative and an individual with an advanced STEM (scientist, engineer, mathematician, or computer scientist) degree from a Core Partner, as well as other relevant sectors.

Limit on Number of Proposals per Organization:

Collaborative proposals: Any proposal submitted in response to this solicitation should be a single submission that includes support for all partners that are requesting funding from NSF. Separately submitted collaborative proposals, as defined in the NSF *Grant Proposal Guide* (Chapter II, Section D.4.b Collaborative Proposals), are not appropriate and will be returned without review.

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

An individual may serve as Principal Investigator or co-Principal Investigator on only one Targeted Partnership proposal (Prototype **or** Implementation) per focal area.

An individual may serve as Principal Investigator or co-Principal Investigator on only one STEM-C Partnerships Computer Education Expansion proposal.

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/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

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

- **Indirect Cost (F&A) Limitations:** Not Applicable

- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

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

    March 18, 2014

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions: Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

The STEM-C Partnerships program is a major research and development effort of two NSF Directorates, the Directorate for Education and Human Resources and the Directorate for Computer and Information Science and Engineering, which supports innovative partnerships to improve teaching and learning in science, technology, engineering, and mathematics (STEM) disciplines. STEM-C Partnerships combines and advances the efforts of both the former Math and Science Partnership (MSP) and the former Computing Education for the 21st Century (CE21) programs. It is critical that our nation maintain a competent, competitive and creative STEM workforce, including teachers. Therefore, a goal of the STEM-C Partnerships program is to inspire and motivate the next generation of that workforce, while ensuring that it has the skills, competencies, and preparation to be successful. Since aspiring teachers acquire a depth of understanding in the sciences, mathematics, engineering, and computer science during their undergraduate years, the STEM-C Partnerships program is also a K-16 effort seeking innovations in policies, pedagogies, programs, and/or in STEM disciplinary courses that support STEM teachers. A second goal of the program is to elevate the inclusion of computer science in K-12 education.

II. PROGRAM DESCRIPTION

Through this solicitation, NSF seeks to support two types of awards: Targeted Partnership awards and STEM-C Partnerships Computer Science Education Expansion awards.

Targeted Partnership proposals focus on new innovations in K-12 mathematics, computer science, engineering, or science education, linked to a strong educational research agenda, in one of five focal areas. Targeted Partnerships study and solve issues of importance to STEM education related to teaching and learning within a specific grade range or at a critical juncture in education, and/or within a specific disciplinary focus. All Targeted Partnership proposals include a research question(s) and research design with appropriate methodology. While focusing on **one** of the following focal areas, proposals may include strategies that incorporate aspects of other focal areas as necessary to support the goals of the proposed project.

- *Community Enterprise for STEM Teaching and Learning -* The focus is to expand the composition of partnerships beyond school districts and higher education in order to provide and integrate necessary supports for students so they can learn challenging mathematics, science, engineering, and/or computer science. This involves attentiveness to aspects of learners' lives that reach beyond the school setting. These projects involve K-12 school districts with other partners to provide multifaceted resources that (a) broaden teaching and learning by incorporating additional STEM assets of the community, such as institutions of higher education, museums/zoos/parks/aquariums, science centers, business & industry, or national/state-funded science/engineering/technology laboratories and centers, and/or (b) address the social situations of students by engaging necessary and important community entities, such as social services, family/parent organizations, before/after school providers, or civic organizations. The research agenda should be linked to the community aspect of the work. Documenting learning across formal and informal educational settings is encouraged.
- *Current Issues Related to STEM Content* - The focus is on innovative solutions related to current key issues in STEM education, such as, but not limited to, Common Core State Standards, Next Generation Science Standards, engineering in the K-12 curriculum (both stand-alone and in interdisciplinary contexts), or as identified in a recent National Research Council report on successful K-12 STEM education. As rich conceptual understanding is central to all such issues, these projects should be narrowly focused on one or a few related foundational concepts of the STEM disciplines and advance the capacity of the STEM education system to provide students with deep knowledge and facility related to these concepts. These projects can also consider the continuity of college and career ready standards in specific content domains, especially between high school and early postsecondary education.
- *Teaching and Learning in Computer Science* - The focus is to contribute evidence-based findings to the body of knowledge on teaching and learning of computer science within diverse teacher and student populations. These projects should be designed to expand computer science opportunities for K-12 students in school and/or outside of school while increasing their knowledge of computing and/or computational skills, and computational thinking competencies. These projects may, for example, conduct basic research on the effects of teaching and learning of computational competencies in face-to-face or online settings, including games and other virtual environments; and/or they may design, develop, test, validate, and refine materials, measurement tools, and methods for teaching in specific learning contexts; and/or implement promising small-scale interventions to study the efficacy of interventions with particular groups.
- *Identifying and Cultivating Exceptional Talent* - The focus is on innovative mechanisms for both identifying **and** nurturing "all types of talents" in "all demographics of students" with creative ways of thinking and applying conceptual understandings in the STEM disciplines. These projects should provide students with "coordinated, proactive, sustained formal and informal interventions to develop their abilities...at a pace, depth, and breadth commensurate with their talents and interests and in a fashion that elicits engagement, intellectual curiosity, and creative problem solving" and address the implementation of policies that foster a culture that "nurtures...innovative thinking." (NSB, 2010)
- *K-12 STEM Teacher Preparation* - The focus is on innovations (beyond common place) in pre-service education **and** induction of K-12 teachers of science, mathematics, engineering, and/or computer science. Designing and studying the effectiveness of new teachers in terms of results on student learning is encouraged as is attention to the needs of the next generation of teachers to meet the demands of diverse learners. Supporting STEM teachers as professionals in practicing the art of teaching, from pre-service through induction years, is implicit in these projects. The STEM-C Partnerships program is particularly interested in innovations in the STEM preparation and induction of elementary teachers.

Where appropriate, Partnerships are encouraged to consider incorporation of learning technologies, as well as the study of their impact on the ways students approach learning and problem-solving, in support of proposed project goals. (NSF Task Force on Cyberlearning, 2008).

Two funding levels: In any of the focal areas, the Program will support Prototype awards (up to 3 years, for up to $1.5 million) and Implementation awards (up to 5 years, for up to $7.5 million). Proposals must identify one Focal area and whether the submission is for a Targeted Prototype award or Targeted-Implementation award.

Targeted Partnership proposals for **Prototype** awards **explore potentially innovative** educational approaches/strategies that challenge conventional thinking while building upon existing fundamental educational research. Such projects examine associations between malleable factors (i.e., factors that can be changed, such as but not limited to students' behaviors, teachers' practices, school programs, education policies) and education outcomes. Prototype proposals should present a well-explicated theory of action for the proposed education intervention which the project will try out. The project design framework should be such that the findings are suitable for future broader implementation. The proposal should include a compelling rationale that (a) specifies the practical problem that the project is intended to address, (b) justifies the importance of this problem, and (c) shows how the proposed research will inform the development of the proposed approach/strategies **and** its potential for wider adoption. Prototype Targeted proposals should be attentive to the *Common Guidelines for Education Research and Development* particularly related to Early Stage/Exploratory Research or preliminary Design and Development Research. There should be a strong theoretical and empirical rationale for the project grounded in the STEM education literature.

Targeted Partnership proposals for **Implementation** awards are intended to develop and **put into practice innovative** education approaches/strategies (e.g., instructional approaches, curricula, professional development, technology, school-wide programs) based on educational research. Depending on the complexity and scope of the strategies, the design and development of a project may encompass more than one research study. There should be a compelling rationale that (a) specifies the practical problem that the project is intended to address, (b) justifies the importance of this problem, (c) describes how the proposed approach is different from existing practices, and (d) explains why the proposed approach/strategies have the potential to improve education outcomes or gain efficiencies for education systems beyond what current practices achieve. The proposal should include a description of the approach/strategies that will be implemented and its theory of action, identifying key components of the approach/strategies (i.e., the active ingredients that are hypothesized to be critical to achieving the intended results) and how they relate to each other operationally and theoretically. Implementation Targeted proposals should be attentive to the Common Guidelines for Education Research and Development particularly related to Design and Development Research or, perhaps, Efficacy or Effectiveness Research. There should be a strong theoretical and empirical rationale for the project grounded in the STEM education literature.

STEM-C Partnerships Computer Science Education Expansion awards are open only to NSF MSP Partnerships that have been previously funded to work at the high school level and who seek to expand their work to increase the number of qualified computer science teachers and the number of high schools with rigorous computer science courses incorporated into the academic program. The CSE-Expansion is intended to help advance the CS 10K Project (http://dl.acm.org/citation.cfm?id=2189847) through development of partnerships that support, disseminate, and through research improve high school computer science courses and curricula. Attention to pedagogical practices, teacher methods courses, teacher professional development for high school computer science teachers, as well as to promising practices for increasing the participation of students from underrepresented groups are all appropriate activities which may be supported. Proposers seeking funding through CSE-Expansion may consider implementation of one or both of the following CS 10K supported computer science courses: Exploring Computer Science (http://exploringcs.org/) and CS Principles, an entirely new Advanced Placement (AP) course (http://collegeboard.org/csprinciples) that will be officially launched starting in 2016. Proposers may choose to focus on other academic high school computer science courses, but must demonstrate how their work can be expected to have comparable sustainable, national significance to these two courses in terms of both increasing and broadening participation. Proposals for CSE-Expansion funding must include a research question(s) and research design with appropriate methodology. Inclusion of computer scientists in the Partnership is required. Proposals for CSE-Expansion should be submitted as supplements from current MSP awardees or as new proposals from past MSP awardees.

IMPORTANT PROJECT COMPONENTS of ALL PARTNERSHIPS

Targeted and CSE-Expansion projects may vary considerably in the content and grade bands addressed, the approaches taken, the number of partners involved, the number of STEM disciplinary experts and STEM education researchers that participate, the number of teachers and building/district administrators contributing, the number of students impacted and the number of educational and/or social/behavioral/economic sciences researchers assisting. However, all promising projects share certain traits. Overarching defining characteristics are: (a) it is necessary for a Partnership to be mutually beneficial in order for the proposed work and outcomes to be accomplished, i.e., the proposed work is such that without the Partnership it could not be accomplished, and (b) the ideas promoted and attendant research design are of considerable national import to the STEM educational field, i. e., while the Partnership focuses on identified local need, the issue(s) addressed is/are of national importance in STEM education.

Central tenets of the STEM-C Partnerships: MSP endeavor are that all Partnerships:

- are centered on improvement in STEM learning by K-12 students;
- contribute to the literature on STEM teaching and learning, and thus have an explicit research agenda emanating from the project work;
- involve at least one K-12 school district and at least one institution/organization that is actively engaged in teacher education (pre-service and/or in-service) and which brings disciplinary expertise in the social or natural sciences, mathematics, engineering or computer science; and
- utilize expertise of STEM disciplinary experts, educational researchers, and K-12 teachers and administrators, with individuals from the learning sciences

Requirements of ALL Targeted and CSE-Expansion Proposals: All proposals MUST present a framework that employs **innovative** strategies (*beyond the commonplace*) and incorporates **all** of the following:

*Partnership Driven--*The depth and quality of the Partnership, including the substantive leadership involvement of the K-12 Core Partner(s) and the substantive engagement of disciplinary experts (i.e., mathematicians, computer scientists, engineers, or scientists) appropriate to the intents of the project and with clearly defined roles.

*Teacher Quality, Quantity and Diversity--*Strategies and activities that are designed to increase the capacity of pre-service and/or in-service teachers to enhance student learning in STEM, while being attentive to the diversity of the teacher workforce.

*Challenging Courses and Curriculum--*A description of what the K-12 students, within a grade range subset, will be learning through this project that is sufficiently challenging and rigorous to bring about enhanced student mastery of fundamentals, sophisticated conceptual understandings, and ways of thinking essential to allow students to demonstrate success in the STEM discipline(s) that is/are the aim of the project; proposals focusing on K-12 STEM Teacher Preparation should describe the content and skills the pre-service teachers will learn in support of engaging their future K-12 students in challenging STEM courses and curriculum.

Evidence-based Design and Outcomes--Linkages to current research and studies, including theoretical foundations, used to inform the project design **and** the project's research agenda related to the knowledge generation intents of the project and the educational improvements expected. (See *Common Guidelines for Education Research and Development*)

Institutional Change--Identifiable institutional change that will result from the work for **each Core Partner** which will contribute to sustainability of project goals; it is likely that changes in policies, practices, and programs will vary for different Core Partners.

RESPONSIBILITIES OF STEM-C Partnerships: MSP Projects

All STEM-C Partnership projects should expect to participate in data collection and evaluation at the level of the national program as well as conferences (both face-to-face and online). As such, proposals should include planning for this work in management structures and in budgets.

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III. AWARD INFORMATION

For FY2014, NSF expects to make an estimated 8-12 total Targeted Partnership awards, including 4-7 Implementation awards and 4-7 Prototype awards. An additional 4-8 STEM-C Computer Science Education Expansion awards (or supplements) may also be funded in FY2014.

Anticipated Funding Amount: Approximately $57.08 million for new awards and continuing awards in FY2014; pending the availability of funds.

TARGETED PARTNERSHIPS: The maximum total budget for a Targeted Partnership that is a Prototype project is $1,500,000 (average annual budgets of $500,000) with a duration of up to 3 years. The maximum total budget for a Targeted Partnership that is an Implementation project is $7,500,000 (average annual budgets of $1,500,000) with a duration of up to 5 years. Targeted Partnerships awards will be made as standard or continuing grants. Funds requested must directly correlate with the scope and complexity of the budget as well as with the numbers of teachers and/or students engaged in or impacted by the project. As NSF is interested in models of varying scales and scope, but still with national significance, requests for funding of lesser amounts are encouraged. The budget should be commensurate with the scale and scope of the proposed work.

Computer Science Education Expansion (CSE-Expansion): The maximum total budget for a CSE-Expansion award is $500,000 with a duration of up to three years. Two mechanisms for funding are standard grants or supplements. Awards are open only to NSF MSP Partnerships that have been previously funded to work at the high school level. NSF MSP Partnerships that have been previously funded to work at the high school level will be eligible for funding through standard grant awards, while current NSF MSP awardees working at the high school level will be eligible for funding through supplements.

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- State and Local Governments: State educational offices or organizations and local school districts.

Who May Serve as PI:

There is no eligibility requirement for the Principal Investigator of a Targeted Partnership proposal or a STEM-C Partnerships Computer Science Education Expansion proposal. The Partnerships will include cross-disciplinary teams that call upon the expertise and research perspectives of learning scientists, including cognitive scientists, educational, developmental and social psychologists, social scientists and education researchers, as well as STEM discipline-specific teachers, faculty, researchers, and scientists. Therefore, the team of the Principal Investigator and co-Principal Investigators for a Partnership must include individuals who represent the various fields that are the focus of study, including a K-12 Core Partner organizational representative and an individual with an advanced STEM (scientist, engineer, mathematician, or computer scientist) degree from a Core Partner, as well as other relevant sectors.

Limit on Number of Proposals per Organization:

Collaborative proposals: Any proposal submitted in response to this solicitation should be a single submission that includes support for all partners that are requesting funding from NSF. Separately submitted collaborative proposals, as defined in the NSF *Grant Proposal Guide* (Chapter II, Section D.4.b Collaborative Proposals), are not appropriate and will be returned without review.

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

An individual may serve as Principal Investigator or co-Principal Investigator on only one Targeted Partnership proposal (Prototype **or** Implementation) per focal area.

An individual may serve as Principal Investigator or co-Principal Investigator on only one STEM-C Partnerships Computer Education Expansion proposal.

Additional Eligibility Info:

PARTNERS DEFINITION AND ELIGIBILITY FOR PARTNERSHIPS

Targeted Partnership and CSE-Expansion proposals are developed by Partnerships that must include **Core** Partners and may also include **Supporting** Partners.

CORE PARTNERS

Core partner organizations share responsibility and accountability for the Partnership project. Core partner organizations **are required** to identify the institutional change(s) that will occur and provide evidence of their commitment to undergo the institutional change necessary to sustain the work of the partnership beyond the funding period. This is what distinguishes Core Partner organizations from supporting partner organizations.

Core Partner organizations in each Partnership **must** include:

- At least one institution/organization that is actively engaged in teacher education (pre-service and/or in-service) and which brings disciplinary expertise in the social or natural sciences, mathematics, engineering or computer science **and**
- At least one K-12 local school district.

Core Partner organizations may also include other stakeholder organizations in K-12 STEM education, such as institutions of higher education, state education agencies, business and industry, science centers and museums, disciplinary and professional societies, research laboratories, district-level educational support centers, private foundations and other public and private organizations with interests in K-12 STEM education. The participation of mathematicians, engineers, and/or scientists from these Core Partner organizations is encouraged. Community colleges and minority-serving institutions are encouraged to participate as Core Partner organizations in STEM-C Partnerships projects.

SUPPORTING PARTNERS

Supporting partners include important stakeholders and stakeholder organizations in K-12 STEM education, including parents and families and the types of partner organizations described above. While supporting partners clearly add value to the proposed project, they are not required to commit to the institutional change necessary to sustain project activities beyond the funding period.

LEAD INSTITUTION DEFINITION AND ELIGIBILITY

For all STEM-C Partnerships: MSP awards, one of the Core Partner organizations serves as the **lead** institution and submits the proposal on behalf of the Partnership. The lead partner accepts management and fiduciary responsibility for the project.

Lead institution eligibility for Targeted Partnerships is limited to the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- State and Local Governments: State educational offices or organizations and local school districts.

Lead institution eligibility for CSE-Expansion proposals is limited to a Core Partner from a previously NSF funded MSP award.

PARTNERSHIP LEADERSHIP TEAM DEFINITION AND ELIGIBILITY INFORMATION

The Partnership Leadership Team **must** include those individuals identified in the proposal as Principal Investigator and co-Principal Investigators.

There is no eligibility requirement for the Principal Investigator of a proposal for a Targeted Partnership proposal. However, the Principal Investigator of each Targeted Partnership must be an individual who can represent the Lead Core institution.

The Partnerships will include cross-disciplinary teams that call upon the expertise and research perspectives of learning scientists, including cognitive scientists, educational, developmental and social psychologists, social scientists and education researchers, as well as STEM discipline-specific teachers, faculty, researchers, and scientists. Therefore, the team of the Principal Investigator and co-Principal Investigators for a Partnership must include individuals who represent the various fields that are the focus of study, including

- a K-12 Core Partner organizational representative **and**
- an individual with an advanced STEM (scientist, engineer, mathematician, or computer scientist) from a Core Partner, as well as other relevant sectors.

It is also encouraged that the Partnership Leadership Team includes educational researchers and researchers from the social/behavioral/economic sciences. Proposals may also identify a Project Director who is responsible for day-to-day management of the project. These individuals may be, but are not required to be, identified as a Principal Investigator or co-Principal Investigator.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

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

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

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

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.4 of the Grant Proposal Guide provides additional information on collaborative proposals.

Important Proposal Preparation Information: FastLane will check for required sections of the full proposal, in accordance with *Grant Proposal Guide* (GPG) instructions described in Chapter II.C.2. The GPG requires submission of: Project Summary; Project Description; References Cited; Biographical Sketch(es); Budget; Budget Justification; Current and Pending Support; Facilities, Equipment & Other Resources; Data Management Plan; and Postdoctoral Mentoring Plan, if applicable. If a required section is missing, **FastLane will not accept the proposal.**

Please note that the proposal preparation instructions provided in this program solicitation may deviate from the GPG instructions. If the solicitation instructions do not require a GPG-required section to be included in the proposal, insert text or upload a document in that section of the proposal that states, "Not Applicable for this Program Solicitation." Doing so will enable FastLane to accept your proposal.

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

The following instructions **supplement** guidelines in the GPG and NSF Grants.gov Application Guide.

After selecting the STEM-C Partnerships: MSP program solicitation number on the Cover Sheet, the "NSF Unit Consideration" must be specified -- either Targeted or Phase II (for Computer Science Education Expansion). Grants.gov Users: The program solicitation number will be pre-populated by Grants.gov on the NSF Grant Application Cover Page. Grants.gov users should refer to Section VI.1.2. of the NSF Grants.gov Application Guide for specific instructions on how to designate the NSF Unit of Consideration.

HUMAN SUBJECTS

- On the Cover Sheet, mark the **Human Subjects** box as pending, approved, or exempted (with exemption subsection indicated). **This box should not be left blank.**
- **Human Subjects** box should be marked as pending if an IRB is either (1) reviewing the project plan and has not yet determined a ruling of "approved" or "exempt", or (2) the project plan has not yet been submitted to an IRB for review.

Projects involving research with human subjects, or the reporting of information gathered from human subjects, must ensure that subjects are protected in conformance with the relevant federal policy known as the Common Rule (*Federal Policy for the Protection of Human Subjects*, 45 CFR 690). All projects involving human subjects must either (1) have approval from the organization's Institutional Review Board (IRB) before issuance of an NSF award or, (2) must affirm that the IRB or an appropriate knowledgeable authority previously designated by the organization (not the Principal Investigator) has declared the research exempt from IRB review, in accordance with the applicable subsection, as established in section 101(b) of the Common Rule. If the box for "Human Subjects" is checked on the Cover Sheet along with either (1) the IRB approval date, or (2) the exemption subsection from the Common Rule identified, then no additional certification is required. In the event the proposal is recommended for funding and IRB review is pending, certification of IRB approval or exemption should be submitted to NSF in electronic form as soon as it is available. Delays in obtaining IRB certification may result in NSF being unable to make an award. For more information regarding the protection of human subjects, consult: http://www.nsf.gov/bfa/dias/policy/human.jsp.

PROJECT SUMMARY

Each proposal must a submit a one-page summary of the project. The Project Summary should be written in the third person and be informative to other persons working in the same or related fields.

The Project Summary consists of three sections:

(1) Overview

It should begin by listing the following:

- the title of the proposed project,
- the name of the lead partner,

- the name(s) of additional Core Partners,
- the name(s) of any supporting partners.

If it is a Targeted proposal, it should also indicate whether it is an **Implementation** or **Prototype** project, and the project's **one** targeted focal area -- Community Enterprise for STEM Teaching and Learning, Current Issues Related to STEM Content, Teaching and Learning in Computer Science, Identifying and Cultivating Exceptional Talent, **or** K-12 STEM Teacher Preparation.

This Overview should also include a brief description of the project vision, goals, and work for obtaining the project's intents if the proposal were funded.

For all proposals, the text of the Summary should include, where applicable, the numbers of teachers to be directly engaged in the project, the number of new teachers that will be prepared, and the number of students (including grade ranges) who will benefit from the proposed work.

(2) Intellectual Merit: a statement on the intellectual merit of the proposed activity

- The statement on intellectual merit should describe the potential of the proposed activity to advance knowledge, and

(3) Broader Impacts: a statement on the broader impacts of the proposed activity.

- The statement on broader impacts should describe the potential of the proposed activity to benefit society and contribute to the achievement of specific, desired societal outcomes.

Please note that as part of NSF's effort to implement automated compliance checking in FastLane, the project summary section will now include three text boxes (Overview, Intellectual Merit, and Broader Impacts) and information must be entered into all three text boxes or the proposal will not be accepted by FastLane.

PROJECT DESCRIPTION (including Results from Prior NSF Support)

The Project Description should include the following elements: Vision, Goals and Outcomes; Research and Implementation Framework; Evaluation Plan; Partnership Management/Governance Plan; Institutional Change and Sustainability; and Results from Prior NSF Support.

Vision, Goals and Outcomes

A proposal must clearly describe the project's vision, goals and anticipated outcomes linked to the project's stated theory of action and with respect to all required components of a Partnership.

The Partnership's vision and goals for the project are informed by relevant baseline K-12 student and teacher data, and are consistent with relevant state mathematics or science student academic achievement standards. Baseline data and quantitative outcome goals and annual benchmarks relative to student and teacher outcomes are to be provided in the **Special Information and Supplementary Documentation** section of the proposal.

For the K-12 partner(s), describe the context within which the proposed work will occur, including curricular, instructional, and technological initiatives within which this effort would sit. Also include any policy endeavors that would be supportive of this proposed effort. In what way(s) the K-12 partner(s) will benefit/learn from partnering with the partner(s), as well as the contributions the K-12 partner(s) will make to the Core Partner that is actively engaged in teacher education (pre-service and/or in-service) and which brings disciplinary expertise in the social or natural sciences, mathematics, engineering or computer science.

For other Core Partner institution(s), describe the institutional context for this project and the anticipated work in K-12 STEM education; kinds of prior involvements/experiences with K-12 education of STEM disciplinary experts; and relevant institutional policies/practices that reward such involvement. In what way(s) the partner(s) will benefit/learn from partnering with the K-12 partner(s), as well as the contributions the institutional partner(s) will make to the K-12 partner(s) should be explicit.

The proposal should provide evidence of (a) an effective partnership among Core and supporting organizations that will work together to realize the project's vision and goals, (b) the participation of all key stakeholders (including, but not limited to, teachers, administrators, scientists, computer scientists, engineers and/or mathematicians) in project planning, design and management/decision-making, and (c) sufficient capacity in and preparation of the Partners to support the scale and scope of the project.

Research and Implementation Framework

Describe in detail the plan by which the Partnership will achieve the project vision, goals and anticipated quantitative outcomes by means of a coherent research and implementation plan. This description should include the research or evidence base that constitutes the foundation on which the proposed work rests. The proposal should offer a clear rationale for the strategic actions, **which extend beyond common approaches,** being proposed, including theoretical foundations that are tied to the appropriate research and literature in STEM education. Consistent with expectations for evidence-based design and outcomes, the proposal should identify the **research questions** to be studied and show how the design of the project will allow warranted claims that the activities conducted by the Partnership contributed to the measured outcomes. All proposals must identify the proposed instruments that would be used to measure outcomes, and the logic of how reasonable, warranted conclusions will link the activities to the outcomes. While expecting partnership work to include a rigorous research component, the program does not specify methodology, which should be determined by the research questions. The individual(s) who will conduct the research should be identified in the proposal. The research component of the proposed work is in addition to the Evaluation Plan (described below) that will demonstrate impact of the project, and goes beyond documentation of implementation to the further generation of evidence. Projects are strongly encouraged to utilize the following resource in their design: *Common Guidelines for Education Research and Development.*

Consistent with being partnership-driven, describe how each partner will contribute to the proposed work, with particular emphasis on the depth and breadth of contributions mathematicians, engineers, and/or scientists will make. If applicable, describe how the Partnership collaborates with or complements other K-12 educational initiatives supported by NSF and/or other private or public funds.

Provide a project timeline that correlates with the proposed action plan and the quantitative outcome goals and annual benchmarks described in the **Special Information and Supplementary Documentation** section of the proposal.

For a Prototype project, there should be a compelling rationale that (a) specifies the practical problem that the project is intended to address, (b) justifies the importance of this problem, and (c) shows how the proposed research will inform the development of the proposed approach/strategies **and** its potential for wider adoption. The theory of action should be explicitly stated, supported by a strong theoretical and empirical rationale for the project grounded in the STEM education literature.

For an Implementation project, there should be a compelling rationale that (a) specifies the practical problem that the project is intended to address, (b) justifies the importance of this problem, (c) describes how the proposed approach is different from existing practices, and (d) explains why the proposed approach/strategies have the potential to improve education outcomes or gain efficiencies for education systems beyond what current practices achieve. The proposal should include a description of the approach/strategies that will be implemented and its theory of action, identifying key components of the approach/strategies (i.e., the active ingredients that are hypothesized to be critical to achieving the intended results) and how they relate to each other operationally and theoretically. There should be a strong theoretical and empirical rationale for the project grounded in the STEM education literature.

Evaluation Plan

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

Partnership Management/Governance Plan

Describe the management plan, demonstrating that all Partners are fully engaged as mutual Partners to realize the Partnership's vision, goals and outcomes.

Describe in detail the specific roles, responsibilities and time commitments of the members of the Partnership Leadership Team. Also provide the number of mathematicians, computer scienctists, engineers and/or scientists who will be engaged in the work of the project and their intellectual contributions/roles and responsibilities, referring to individuals listed in a Disciplinary Partner table located in the **Special Information and Supplementary Documentation**.

Institutional Change and Sustainability

Describe how the proposed action plan will result in institutional change within all Core Partner organizations to ensure sustainability of project ideas, practices and work. Include plans to redirect resources and develop/revise and implement policies and practices critical for the work of the Partnership and necessary for project sustainability.

Results from Prior NSF Support

If any PI or co-PI identified on the project has received NSF funding in the past five years, information on the award(s) is/are required. Each PI and co-PI who has received *more than one award* (excluding amendments) must report on the award most closely related to the proposal. The Grant Proposal Guide provides guidance on six aspects of prior support that are required to be reported (GPG NSF 11-1). Lessons learned from previous and current support, including a discussion of successes and failures, should be included. **The proposal should also clearly indicate how the intended work differs from, builds on or is otherwise informed by prior efforts,** *especially those supported by NSF.*

BIOGRAPHICAL SKETCH

Provide a Biographical Sketch for the Principal Investigator, co-Principal Investigators and External Project Evaluator. Individual biographical sketches must not exceed two pages and may include a list of up to five publications most closely related to the proposed endeavor.

CURRENT AND PENDING SUPPORT

Include Current and Pending Support information for the Principal Investigator and all co-Principal Investigators.

SPECIAL INFORMATION AND SUPPLEMENTARY DOCUMENTATION

The Data Management Plan and Postdoctoral Researcher Mentoring Plan (if applicable) are submitted in the Special Information and Supplementary Documentation section in Fastlane or Grants.gov. In addition, Appendices and letters of support may be submitted consistent with the information below.

Appendices are permitted and should be uploaded in Fastlane or Grants.gov as a separate PDF file **not to exceed 25 pages** (this page limitation is in addition to the Data Management Plan and the Postdoctoral Researcher Mentoring plan).

Include in this documentation:

1. Baseline Data. **Students**: For the Core Partners, provide baseline student data that will enable the Partnership to demonstrate the effects of the project on the achievement of students and on other student outcomes. Student data should be disaggregated by race-ethnicity, socio-economic status, gender and disability, unless precluded by local or state law. (Baseline data on K-12 students are not necessary for the K-12 STEM Teacher Preparation focal area.) **Teachers**: For the Core Partners, provide data to describe the current teacher capacity in the STEM discipline(s) with which the proposal is involved. This should include: the number of teachers in the discipline and grade range; demographics of teachers (gender, ethnicity/race, number of years of teaching, baccalaureate/masters degrees, teaching out of the certification field, retention, and professional development hours within the discipline in the last three years). Also provide teacher preparation and/or professional development data that describe the current capacity of the Core Partner institution/organization(s) that is actively engaged in teacher education relative to the teacher professional continuum needs of the school district Core Partner(s). **Other data**: Data that assist in describing the need that will be addressed through the proposed project may also be included and are not limited to student and teacher data.

2. Annual Benchmarks and Outcome Goals. Provide a summary of quantitative benchmarks that are linked to strategies/activities and summative goals of the project. While some benchmarks and goals may be qualitative in nature, many indicators of outcomes related to students, teachers, administrators, classrooms, schools, higher education faculty, and the institutions and other entities involved should be quantitative. These benchmarks and outcomes goals should describe expected project progress relative to baseline data provided elsewhere in the Project Description and Appendices. The project's proposed Evaluation Plan should directly relate to the benchmarks and goals.

3. Partnership Leadership Team. In a table, identify members of the Partnership Leadership Team. For each, briefly describe their

specific roles and responsibilities and indicate the time committed.

4. Disciplinary Partners. In a table, identify the mathematicians, computer scientists, engineers and/or scientists engaged in the work of the project, as well as other necessary expertise. For each, briefly describe their specific roles and responsibilities and indicate the time committed.

5. Commitment to Institutional Change. Provide evidence of commitment to institutional change in the form of one or more letters signed by senior administrator(s) in the Core Partner.

6. Other Letters of Substantive Commitment. As space will allow, provide letters of substantive commitment from other project partners.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

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 scope and complexity of the proposed activities of the project should be included.

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

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

    March 18, 2014

D. FastLane/Grants.gov Requirements

For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: https://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: http://www.grants.gov/web/grants/applicants.html. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

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

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

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

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

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Empowering the Nation Through Discovery and Innovation: NSF Strategic Plan for Fiscal Years (FY) 2011-2016*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the core strategies in support of NSF's mission is to foster integration of research and education through the programs, projects and activities it supports at academic and research institutions. These institutions 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 variety of learning perspectives.

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

A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

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

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

2. Merit Review Criteria

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

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

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

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

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

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

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific

knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

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

Additional Solicitation Specific Review Criteria

In elaboration of the general NSF review criteria, reviewers will also be asked to review proposals by considering the following questions:

- Is science, mathematics, computer science, and/or engineering expertise from Core Partners deeply and broadly involved in the proposed work?
- Is the potential high for strategic impact on teaching and learning and is the research likely to be of high importance to STEM education?

In addition to the two criteria above, the review of Targeted Partnership proposals should also consider the following:

- Does the proposal clearly identify one of the five focal areas and provide an implementation plan explicitly linked to the project's stated theory of action?

B. Review and Selection Process

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

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

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

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

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

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

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is

contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

Special Award Conditions:

Additional award conditions apply. Please see "Responsibilities of MSP Projects" in "Section II. Program Description."

C. Reporting Requirements

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

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

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

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

VIII. AGENCY CONTACTS

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

General inquiries regarding this program should be made to:

- Kathleen B. Bergin, telephone: (703) 292-5171, email: kbergin@nsf.gov

- Janice Cuny, telephone: (703) 292-8900, email: jcuny@nsf.gov

- Arlene M. de Strulle, telephone: (703) 292-8620, email: adestrul@nsf.gov

- Valerie Barr, telephone: (703) 292-7855, email: vbarr@nsf.gov

- John Haddock, telephone: (703) 292-4643, email: jhaddock@nsf.gov

- Christopher Hoadley, telephone: (703) 292-7906, email: choadley@nsf.gov

- Michael Jacobson, telephone: (703) 292-4641, email: mjacobso@nsf.gov

For questions related to the use of FastLane, contact:

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

For questions relating to Grants.gov contact:

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

IX. OTHER INFORMATION

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

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

> This solicitation incorporates a newly issued publication jointly developed by the National Science Foundation and the Institute of Education Sciences in the U.S. Department of Education entitled, *Common Guidelines for Education Research and Development*. The *Guidelines* describe six types of research studies that can generate evidence about how to increase student learning. Research types include those that generate the most fundamental understandings related to education and learning; examinations of associations between variables;

iterative design and testing of strategies or interventions; and assessments of the impact of a fully-developed intervention on an education outcome. For each research type, there is a description of the purpose and the expected empirical and/or theoretical justifications, types of project outcomes, and quality of evidence.

The *Guidelines* publication can be found on the NSF website with the number NSF 13-126:
http://www.nsf.gov/pubs/2013/nsf13126/nsf13126.pdf

A set of FAQs regarding the *Guidelines* are available with the number NSF 13-127:
http://www.nsf.gov/pubs/2013/nsf13127/nsf13127.pdf

Grant proposal writers and PIs are encouraged to familiarize themselves with both documents and use the information therein to help in the preparation of proposals to NSF.

RELATED PROGRAMS

Investigators interested in this program may also be interested in the STEM-C Partnerships: CE21 solicitation in the Directorate for Computer & Information Sceince & Engineering,Improving Undergraduate Education (IUSE) and Advanced Technological Eduation (ATE) in the Divison of Undergraduate Education in the Directorate for Education and Human Resources (EHR), as well as the following programs in the Division of Research on Learning in Formal and Informal Settings (DRL) in EHR: Discovery Research K-12 (DRK-12); Research on Education and Learning (REAL); Technology Experiences for Students and Teachers (ITEST); and Promoting Research and Innovation in Methodologies for Evaluation (PRIME).

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

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

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

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

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

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

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

- **Location:**   4201 Wilson Blvd. Arlington, VA 22230

- **For General Information**   (703) 292-5111
  (NSF Information Center)**:**

- **TDD (for the hearing-impaired):**   (703) 292-5090

- **To Order Publications or Forms:**

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

        or telephone: (703) 292-7827

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

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation

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

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

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

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

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11/07/06
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