STEM + Computing Partnerships (STEM+C)

PROGRAM SOLICITATION
NSF 16-527

REPLACES DOCUMENT(S):
NSF 15-537

National Science Foundation

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

Directorate for Computer & Information Science & Engineering
Division of Computing and Communication Foundations
Division of Computer and Network Systems
Division of Information & Intelligent Systems
Division of Advanced Cyberinfrastructure

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

March 28, 2016

March 14, 2017

Second Tuesday in March, Annually Thereafter

IMPORTANT INFORMATION AND REVISION NOTES

This solicitation incorporates a 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; examination 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 expected empirical and/or theoretical justifications, types of project outcomes, and quality of evidence. Grant proposal writers and PIs are encouraged to familiarize themselves with this document to help in the preparation of proposals to NSF. The publication can be found on the NSF website (NSF 13-126): http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13126. A set of FAQs is available at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13127

Revision Notes

This Solicitation replaces the FY15 STEM+C Solicitation (NSF 15-537). The revisions include:

1. **Revision to Track 1**: The Exploratory Integration project type maximum duration has been expanded from a maximum duration of two years to a maximum duration of three years to provide an additional year to analyze project findings.
2. **Revision to Track 2**: The Research on Education and Broadening Participation project type description has been has changed to more accurately specify the kinds of expertise from social science and education researchers that must be included in proposed collaborations.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 16-1), which is effective for proposals submitted, or due, on or after January 25, 2016. Please be advised that proposers who opt to submit prior to January 25, 2016, must also follow the guidelines contained in NSF 16-1.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

STEM + Computing Partnerships (STEM+C)

Synopsis of Program:

The STEM+Computing Partnerships program seeks to significantly enhance the learning and teaching of science, technology, engineering, mathematics (STEM), and computing by K-12 students and teachers through research on, and development of, courses, curriculum, course materials, pedagogies, instructional strategies, models, or pedagogical environments that innovatively integrate computing into one or more other STEM disciplines, or integrate STEM content into the teaching and learning of computing. In addition, STEM+C seeks to build capacity

in K-12 computing education with foundational research and focused teacher preparation. Projects in the STEM+C program should build on research in STEM education and prior research and development efforts that provide theoretical and empirical justification for proposed projects. Pre-service and in-service teachers who participate in STEM+C projects are expected to enhance their understanding and teaching of STEM and computing content, practices, and skills.

STEM+C invites creative and innovative proposals that address emerging challenges in the learning and teaching of STEM and computing. The program offers proposers two tracks: (1) Integration of Computing in STEM Education and (2) Computing Education Knowledge and Capacity Building. The second track is discipline-specific and may be expanded to include additional disciplines in future releases of the solicitation.

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.

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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: 30 to 37

For FY2016, NSF expects to make 20-25 awards in **Track 1** and 10-12 awards in **Track 2**, subject to the availability of funds.

Anticipated Funding Amount: $47,000,000

For FY2016, it is expected that $47 million will be allocated for new awards, subject to the availability of funds.

Eligibility Information

Who May Submit Proposals:

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

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 2

An individual may serve as Principal Investigator or Co-Principal Investigator for no more than two proposals. **These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently**. In the event that an individual exceeds this limit, proposals received within the limit will be accepted based on earliest date and time of proposal submission (i.e., the first two proposals received will be accepted and the remainder will be returned without review). **No exceptions will be made.**

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

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

ods_key=grantsgovguide)

B. Budgetary Information

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

C. Due Dates

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

  March 28, 2016

  March 14, 2017

  Second Tuesday in March, Annually Thereafter

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria apply.

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 + Computing Partnerships (STEM+C) program seeks to advance a 21st century conceptualization of education in science, technology, engineering and mathematics (STEM) that includes computing, both as a STEM discipline in its own right consistent with the STEM Education Act of 2015, which explicitly includes computing as a STEM discipline for purposes of federal programs [1] and as a discipline integral to the practice of all other STEM disciplines.

In this solicitation, computing, which "builds on the power and limits of computing processes, whether they are executed by a human or by a machine" [2], refers broadly to the fundamental concepts and skills of computational thinking that will allow students to conceptualize problems and represent them in ways that can be carried out by a computer. Computational thinking "involves solving problems, designing systems, and understanding human behavior" (Wing, 2006, p.33). Computational competencies will allow students to apply and adapt computation to solving critical problems across many disciplines and domains, and "bend digital technology to one's needs, purposes, and will."[3] The solicitation broadens the definition of "computer science" to include computational science, data science, human computer interfaces, and cybersecurity.

Computing has become an integral part of the practice of modern science, math, and engineering. As a result, computational approaches are dramatically increasing the understanding of the world and society -- from particle physics to biological and social systems to Earth systems science. Computation is now so central to the practice of science and engineering that the President's Information Technology Advisory Committee's Report to the President, Computational Science: Insuring America's Competitiveness (2005), called computation the "third pillar of scientific practice," joining the two classical approaches of theoretical/analytical and experimental/observational. The translation of mathematical models of phenomena into computer simulations allows scientists to analyze systems, predict the future and reconstruct the past, on a scale far greater in complexity than previously possible. In addition, scientists now have the ability to collect, query, visualize and analyze unprecedented amounts of data. These computational capabilities are revolutionizing the science, mathematics, and engineering disciplines.

All students—but particularly STEM students—need to understand the role of computation and computational thinking within disciplinary problem solving. The report by the President's Council of Advisors on Science and Technology, Prepare and Inspire: K-12 Science, Technology, Engineering, and Math (STEM) Education for America's Future (2010, p.46) recommends a definition of K-12 STEM education that includes computer science, and states that students need "a deeper understanding of the essential concepts, methods and wide-ranging applications of computer science. Students should gain hands-on exposure to the process of algorithmic thinking and its realization in the form of a computer program, to the use of computational techniques for real-world problem solving, and to such pervasive computational themes as modeling and abstraction, modularity and reusability, computational efficiency, testing and debugging, and the management of complexity. Where feasible, active learning, higher-level thinking, and creative design should be encouraged by situating new concepts and techniques within the context of applications of particular interest to a given student or project team." A report by the National Research Council further underscores that computational thinking skills are essential in the K-12 curriculum for reasons including, "succeeding in a technological society, increasing interest in the information technology professions, maintaining and enhancing U.S. economic competitiveness, supporting inquiry in other disciplines, and enabling personal empowerment." (NRC, 2011c). Today, however, too few students have the opportunity to gain these understandings and skills in or out of school. The report also points out that there is a scarcity of research to inform the teaching of computational thinking in the early grades and, as a result, computer science is often taught without consideration for age-appropriate learning.

The STEM + Computing Partnerships (STEM+C) program targets these research gaps, seeking to build the evidence base for new and effective pedagogy and pedagogical environments that will make the integration of computational thinking in other STEM disciplines, and computer science itself, increasingly more relevant through contextually relevant problem solving, applications, and activities.

To attract students into STEM, including computing fields, it is important that computing be well-integrated into the existing STEM curricula for students to see the effectiveness of applying computational approaches across a range of disciplines and real world applications within those disciplines. Students may have a better understanding of STEM if they can see the exciting and creative modes of scientific exploration made possible by advances in computation, such as visualizations of scientific concepts and the use of high performance computing in physics, climate research, weather modeling, molecular chemistry, and biology. The nation needs a well-prepared, innovative, and globally competitive STEM workforce and there is urgency to provide a strong base for that workforce in schools. One expectation of the STEM+C program is that it will prepare undergraduate students to confront these new challenges in computational and data-enabled science and engineering.

The STEM+C program challenges STEM educators to approach STEM, including computing education with a new lens, integrating computing as part of traditional STEM disciplinary learning, and taking advantage of the cultural assets of communities and of data-enabled social media to foster a stronger ecology of learning. Such integration of computing with other STEM teaching and learning may well have profound effects on the way STEM is taught - reflecting the increasing role of computational approaches in learning across the STEM disciplines, and fostering more multidisciplinary and collaborative approaches for learning both in and out of school. Proposers may consider situating their work in the context of a more comprehensive approach integrating computing and computational thinking across an entire STEM curriculum, along with the integration of relevant STEM content and applications into computer science courses.

The STEM+C program supports integrative efforts across one or more domains and discipline specific efforts in computing.

[1] Public Law No: 114-59, STEM Education Act of 2015
[2] Wing, J. (2006) Computational Thinking, Communications of the ACM, March, Vol. 49, No. 3
[3] "Programming Is the New Literacy," Marc Prensky, Edutopia, January 13, 2008.

II. PROGRAM DESCRIPTION

The STEM+C program is a joint research and development effort of the National Science Foundation's Directorate for Education and Human Resources (EHR) and Directorate for Computer and Information Science and Engineering (CISE). STEM+C seeks to (1) significantly enhance the learning and teaching of science, technology, engineering, mathematics, and computing by K-12 students and teachers through research on, and development of, innovative courses, curriculum, course materials, pedagogies, strategies, pedagogical environments, or models that integrate computing into one or more of the other STEM disciplines (Track 1), and (2) build capacity in K-12 computing education through foundational research and focused CS teacher preparation (Track 2).

Projects proposed for the STEM+C program should build on research in STEM, including computing education, and prior research and development efforts that will provide theoretical and empirical justification. Pre-service and in-service teachers who participate in STEM+C projects are expected to enhance their understanding and use of STEM and computing content, practices, and skills.

Eligible STEM+C Proposal Types

The program offers two Tracks: (1) Integration of Computing in STEM Education and (2) Computing Education Knowledge and Capacity Building.

Track 1: Integration of Computing in STEM Education

As computing has become an integral part of the practice of modern science, mathematics, and engineering, this track seeks proposals for teaching and learning in K-12 that will (1) integrate computing and computational thinking into science, technology, engineering, and mathematics education, and/or (2) integrate science, mathematics, and engineering content into computer science education. Proposers may also consider situating their work in the context of a more comprehensive approach that integrates computing and computational thinking across an entire STEM curriculum.

The program seeks research that will inform new pedagogical strategies and pedagogical environments for integrating computing and computational thinking in STEM disciplines or for integrating science, mathematics, and engineering content into computer science education. Proposers are expected to have formed multidisciplinary partnerships with computing and other STEM disciplinary educators, STEM researchers in universities and colleges, education researchers and other appropriate personnel to advance teaching and learning appropriate to this Track (see Multidisciplinary Partnerships, below).

Track 1 Project Types

1. Exploratory Integration (EI): (up to $1,250,000); maximum duration three years.

Exploratory proposals might: address the development of prototypes and associated design research; conduct pilot testing; study areas of instructional practice; or conduct research to provide proof-of-concept and preliminary evidence. It is expected that some of the funded projects in this category, depending on research findings, will serve as prototypes or pilots for ideas that may be expanded in future proposals to the STEM+C Partnerships program. Proposals must articulate specific research questions, discuss content to learned, provide detailed information on the process for identifying, adapting or designing instruments to measure outcomes, and if appropriate to the intervention, ways to determine levels of technical quality. Exploratory proposals should be consistent with the Early Stages and Exploratory type of research and development in the Common Guidelines for Educational Research and Development.

2. Design and Development (DD): (up to $2,500,000); maximum duration three years.

Design and development proposals should build on evidence from education or social science research and disciplinary education, as is applicable to the project. Proposals may build upon work demonstrating promise for impact on student or teacher learning in classrooms, schools, out-of-school environments, or other learning settings, or propose entirely new or innovative interventions for design, research, and testing. Projects are expected to contribute research findings to inform the improvement of STEM learning. Plans should be articulated for dissemination of results to researchers, practitioners, or other approaches to bringing tested interventions to scale. Design and Development proposals should be consistent with the Design and Development type of research and development in the Common Guidelines for Educational Research and Development.

3. Field-Building Conferences and Workshops (CW): (up to $250,000); maximum duration two years.

The program will support conferences, workshops, and special projects that lead to a better understanding of issues around the integration of computing within the other STEM disciplines, and/or issues integrating other STEM disciplines into computer science, as expressed in the solicitation. Budgets for conferences and workshops are expected to be consistent with the duration of the event and the number of participants. It is expected that proposed work will be outcome based. The program encourages proposals that have potential to build the field and body of evidence leading to effective, multidisciplinary integration of computing with other STEM disciplines.

All Track 1 project types must include a literature review that establishes the basis for the proposed study; relevant and fully articulated research questions; description of the alignment of research and evaluation questions with methodologies; alignment of research and evaluation with anticipated project outcomes; articulation of specific computational concepts, competencies, and skills applicable to the project's educational and research objectives, and project outcomes.

The publication, Common Guidelines for Education Research and Development, offers guidance on building the evidence base in STEM learning: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13126.

Elements of Track 1 Proposals

Multidisciplinary Partnerships. The Track 1 objective is to advance research that will inform new pedagogical strategies and pedagogical environments in K-12 for integrating computing and computational thinking in STEM disciplines or integrate science, mathematics, and engineering content into computer science education. Such work requires a multidisciplinary approach to study what makes an effective pedagogy for promoting computational thinking in STEM education. As an example, studying the effects of students learning Earth science with data visualization, modeling, and simulation would require evolving student competencies in computing, systems thinking, and computational thinking. As is applicable to the project, other STEM practitioners, researchers in universities and colleges, education researchers, and other appropriate professional personnel should be considered.

As STEM+C is interested in projects that propose to test ideas in a range of learning settings and demographic contexts, investigators are encouraged to consider multi-sector partnerships, such as industries with vested interest in evolving skills and competencies in STEM, including computing, in the current and future workforce, or engaging schools and organizations for informal learning to collaborate on the testing of ideas and tools for potential classroom adoption. Collaborations should be substantive - seeking to create innovative pedagogical solutions, strategies, and research that could not be achieved without such collaboration, and that will be responsive to advancing of both knowledge and practice of STEM including computing education.

All projects are encouraged to consider broadening the project team, as is appropriate to the project, to include learning scientists, cognitive scientists, education researchers, discipline-specific teachers and faculty, school personnel and district leadership, educational, developmental, and social psychologists, social scientists, education technologists, out-of-school learning practitioners and researchers, informal educators, education media and technology developers, and representatives from business, industry, and school districts to inform career direction.

Projects may consider including in their evaluation plan a study of the collaboration process itself and the effects of the collaboration on project results.

Research. All proposals should be designed to build knowledge through research to inform the integration of computing in other STEM disciplines. Proposals should explicitly state research question(s), including researchable questions leading development efforts and why the proposed research is important in STEM and computing education. Projects should detail the methods used to answer research questions, build systematic understanding of the research issues, and/or test the hypotheses posed, along with the types of data to be collected, methods for data collection, and methods for storing and management of collected data. **Please note that a separate Data Management Plan document is also required to be submitted as part of your proposal application.** If a population sample is used, this should be described along with the rationale for sample selection and access to the sample. PIs are encouraged to test ideas in a range of learning settings and demographic contexts. Proposals should address whether the design is premised on special needs and interests due to educational level, gender, race, ethnicity, economic status, or disability, to what extent data will be disaggregated for multiple characteristics. Proposals should include a strategy for reaching a broad audience and/or for scaling the findings of the project including, where appropriate, researchers in education and other fields, practitioners, and public audiences. The potential results of the proposed research are expected to be of sufficient significance and quality to warrant merit peer-review and broader publication. (For additional information on dissemination and communication see the resources available from the American Association for the Advancement of Science's Center for Public Engagement with Science &

Technology and the Dissemination and Communication Resources available from the Center for Advancing Research & Communication.)

Intervention types. The range of anticipated projects is quite broad in Track 1. Projects may invent, pilot, or modify one or more STEM courses or curricula - infusing computational approaches into traditional STEM courses or infusing traditional STEM content into computer science courses, or both. Proposers might study and/or develop a new curriculum, course materials, assessments, pedagogy, or new foci for pre-service and in-service teacher preparation. Projects could identify practices for working with datasets and iteratively refine models; develop competencies for student analysis, interpretation, and synthesis of data and self-made discoveries using scientific visualizations for instruction; and/or study engagement in collaborative learning methods; use types of media, technologies, and/or design new tools to create, build, and invent products or computational solutions to domain-specific problems, including interventions needed for learning in and out of school. Products and tools might engage learners in reasoning, systems thinking, and understanding of scientific models, simulations, and visualizations that depict phenomena or any intervention that might potentially improve teaching and learning within the discipline through integration of computing. As noted above, the range of anticipated projects is quite broad; however, common to each project is that it should articulate research questions, the importance of the research to the field, formative and summative assessment, and data collection that, in aggregate, will provide evidence-based insights to inform and advance the field. Proposers who have research-based hypotheses about how to effectively support student learning of computer science concepts might propose to develop learning progressions, modules, or courses and study their impact on student understanding. Proposers might have questions about how to best support pre-service and in-service teachers in understanding computer science and integrating it into their instruction, and so might propose to develop and study approaches to teacher education.

Teacher Preparation and Professional Development. Preparing teachers to effectively facilitate students' computational learning and thinking and cultivate their interest in pursuing STEM, including computing careers is essential to the Nation. Projects can engage two- and four-year institutions to improve prospective teachers' understanding of computation and computational thinking sufficient to engage Pre-K-12 students in real-world science and engineering problems. Projects are expected to build on the extensive research literature on teacher preparation. Proposed research or development should address the outcomes that the intervention is intended to produce, such as potential changes in teachers' attitudes, or proficiency in content knowledge, or application of newly acquired skills, or improved student learning. An external project evaluation is required (see Project Evaluation below).

Proposers may also focus on a wide range of activities in support of the professional development of teachers. Possible activities, include, for example, advances to pedagogy or teaching practices, creation and evaluation of mechanisms for providing scalable professional development, including online modalities, and development of sustainable ongoing support for teachers.

As stated in the Research section above, proposers are expected to engage in research to inform their work. Proposals should explicitly state research question(s), including researchable questions leading any development efforts. The following are two examples of specific research questions:

- What professional development models are most effective for preparing teachers to cultivate computing, computational thinking skills, and ways of knowing in students?
- What strategies for teacher preparation in computational thinking are most effective for teachers from diverse backgrounds?

Examples of research topics applicable to Track 1 are indicated below. Proposers are encouraged to also consider other research topics applicable to Track 1:

- What pedagogical strategies assist students in acquiring skills in the use of computing methods and computational thinking within the Pre-K-12 learning environment?
- What are the powerful strategies and pedagogical environments for developing computing skills within the context of specific STEM disciplines? How do such strategies need to be modified for integrating computing in different disciplines?
- Under what conditions does integrating STEM-relevant content into computer science courses increase student interest, motivation, persistence, and performance in computer science, or other STEM fields? How might such integration broaden participation of women and minorities in computer science?
- What formal and informal learning strategies and models are most effective for making computing more integrated in other disciplines and more inclusive for diverse student communities?
- What professional development strategies are most effective for preparing teachers to cultivate computing skills?

Project evaluation. Proposals must include a strategy for objective external review and feedback processes, including feedback on theoretical frameworks, any data collection plans, analysis plans, and reporting plans. For summative project evaluation, objective external feedback must be provided by an independent external evaluator outside the proposing institution or in different organizational units than the PIs and Co-PIs. The external critical review or evaluation should be sufficiently independent and rigorous to influence the project's activities, formatively, and improve the quality of its findings. Proposals should; (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. Proposals must provide for a formative and summative evaluation that includes assessments of student/teacher learning outcomes and attitudinal changes, as appropriate. Further information and guidance on evaluation can be found in the publication: Common Guidelines for Education Research and Development: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13126

Track 2: Computing Education Knowledge and Capacity Building

In recognition of the fact that computing has a low presence in K-12, this track supports discipline specific efforts in computing education. These efforts should be designed to (1) build an evidence base for effective modes of teaching, learning and supporting student success in computing within diverse populations or (2) create evidence-based scalable models for teacher professional development and sustainable, ongoing teacher support. Proposed efforts should have a strong theoretical and/or empirical rationale informed by the current literature.

Track 2 Project Types

1. Research on Education and Broadening Participation Projects (EBP): (up to $600,000 maximum); duration three years.

These projects focus on foundational research on the teaching and learning of computing in complex socio-cultural environments. These environments include large urban school districts and learning environments with increasing concentrations of poverty, and both rural and urban isolation. Specifically, this track aims to build on innovative means of student engagement to develop an evidence base on how diverse student populations learn fundamental computational concepts and the computational competencies needed to pursue degree programs in computing-related and computationally intensive fields of study. EBP projects must include intentional balanced collaboration between CS education researchers, and social science and education researchers who focus on socio-cultural contexts of learning. The research results could be relevant to student learning across K-20. It could also be relevant

to scaling across large urban school districts and rural districts seeking to make computer science curricula available to all students.

Research on Education and Broadening Participation projects must include a literature review that establishes the basis for the proposed study; a clear description of the alignment of research and evaluation questions with methodologies; and alignment of research and evaluation with anticipated project outcomes. The publication, Common Guidelines for Education Research and Development, offers guidance on building an evidence base for teaching and learning: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13126.

2. CS 10K (CS10K): (up to $1,000,000); duration three years.

Projects from this track will develop the knowledge and evidence-based foundation needed to prepare teachers for the CS 10K Project [1], which aims to have rigorous, academic computing courses taught in 10,000 high schools by 10,000 well-prepared teachers. CS 10K proposals will focus on high school computer science teachers, providing pre-service and in-service teachers with courses, professional development opportunities, and long-term, ongoing support. Proposals must focus on efforts that enable teachers to successfully offer either or both of two new courses: Exploring Computer Science (ECS) or the new Advanced Placement (AP) CS Principles; see ExploringCS.org and CSPrinciples.org.

Elements of Track 2 Proposals

Collaborations. The proposing team for these proposals must include expertise appropriate to the project. In most cases, this will require discipline-specific expertise in computing from teachers and faculty, combined with expertise in educational research, learning sciences, cognitive science, developmental and social psychology, and/or the social sciences. The proposing team for these proposals must include expertise in educational research, learning sciences and/or issues of underrepresentation that is sufficient for the proposed work.

Attention to diversity. To ensure that advances in computing education are inclusive of our diverse student populations, **all Track 2** proposals must address, as a significant component, the longstanding underrepresentation in computing of women, persons with disabilities, African Americans, Hispanics, Native Americans, and indigenous peoples. It will not be considered sufficient, for example, to situate the work in schools with a high minority enrollment, or to include a member of an underrepresented group on the project team, or to propose interventions that appeal to "all students." While these are all potentially strong aspects of any proposal, successful **Track 2** proposals will likely also describe the demographics of their target audience, demonstrate knowledge of the relevant literature on underrepresentation and awareness of best practices and related efforts, have a concrete plan for improving representation, and have clear metrics and methodologies for documenting outcomes. Data gathered in all proposals must be disaggregated by gender and ethnicity.

Proposers are encouraged to leverage the resources of the Broadening Participation in Computing Alliances (BPC-A): http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503593.

Research. All of the Research on Education and Broadening Participation proposals must focus on research. CS 10K proposers are encouraged to include a research component.

Research components must include a discussion of the education research grounding the proposed work, and well-focused research questions and/or testable hypotheses. Consistent with the Common Guidelines, rigorous quantitative, qualitative, or mixed methods approaches are welcome. The proposal should discuss in detail the methods used to answer the research questions and/or test the hypotheses posed, along with the types of data to be collected and methods for data collection. If a population sample is used, this should be described along with the rationale for sample selection and access to the sample. The proposal should address whether the design is premised on special needs and interests due to educational level, gender, race, ethnicity, economic status, or disability, and to what extent data will be disaggregated for multiple characteristics. Proposals should include a strategy for reaching a broad audience for the findings of the project including, where appropriate, researchers in education and other fields, practitioners, and public audiences. (For additional information on dissemination and communication see the resources available from the American Association for the Advancement of Science's Center for Public Engagement with Science & Technology and the Dissemination and Communication Resources available from the Center for Advancing Research & Communication.)

Possible Research on Education and Broadening Participation topics include:

- What strategies and resources are most effective in teaching computer science concepts and skills? How can these strategies be sequenced across K-12 education?
- How can diverse student communities be best served in in learning computing?
- To what extent does taking computer science courses improve students' quantitative, spatial, and/or systems thinking skills? Their persistence in problem solving? Their perceptions of self-efficacy?
- What professional development models are most effective for preparing teachers to cultivate computing skills and ways of knowing by students?
- What factors contribute to successful scaling of effective PD models?
- How do methods need to be modified for teachers who start with different backgrounds?
- What types of ongoing support are necessary for sustained success in student learning or teacher effectiveness?

Teacher Preparation. Proposals can focus on a wide range of activities in support of teaching; for CS10K projects the activities must support the teaching of ECS or CS Principles. Possible activities, include, for example, local accommodations to either the ECS or CS Principles curricula, advances to pedagogy or teaching practices, introduction of methods courses for pre-service teachers and/or teacher certification programs, creation and evaluation of mechanisms for providing scalable professional development including online modalities, and development of sustainable ongoing support for teachers. Project descriptions should address issues of sustainability. Projects are expected to build on the extensive research literature on teacher preparation. Proposals must include an evaluation component to measure the effectiveness of their proposed interventions, and CS 10K awardees will be required to participate in the program-wide CS 10K evaluation. In addition, PIs are encouraged to include a research component, as described above, looking at questions, such as:

- What professional development models are most effective for preparing teachers to cultivate computing skills and ways of knowing within students? How do they scale?
- What strategies for teacher preparation are most effective for teachers from diverse backgrounds?
- What types of follow-up learning may be needed to build upon and enhance achievements made through teacher professional development models?

Evaluation. Track 2 proposals that include an intervention (some Research on Education and Broadening Participation in Computing and most CS10K projects) must provide for a formative and summative evaluation of that intervention that includes assessments of student/teacher learning outcomes and attitudinal changes as appropriate. The evaluation should be designed and performed by an independent evaluator, though data collection and routine tasks are acceptable to be carried out by other members of the project

team. In most cases, the independent evaluator will be from outside the proposing institution, or at least from a different organizational unit than the PIs and Co-PIs. Collected data must be disaggregated by gender, ethnicity, socio-economic status, and disability unless precluded by state or local laws. For further information on evaluation, proposers may want to consult the 2010 User Friendly Handbook for Project Evaluation (https://www.westat.com/sites/westat.com/files/2010UFHB.pdf) and other resources.

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III. AWARD INFORMATION

The maximum total budget for **Track 1: Integration of Computing in STEM Education** awards is $2.5 million for Design and Development awards, $1.25 million for Exploratory Integration awards, and $250,000 for Field-Building Conferences and Workshops. The maximum total budget for **Track 2: Computing Education Knowledge and Capacity Building** awards is $600,000 for Research on Education and Broadening Participation awards and $1.0 million for CS 10K awards. NSF is interested in models of varying scales and scope with potential for national significance; the funds requested should be commensurate with the scale and scope of the proposed work.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

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

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 2

An individual may serve as Principal Investigator or Co-Principal Investigator for no more than two proposals. **These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently**. In the event that an individual exceeds this limit, proposals received within the limit will be accepted based on earliest date and time of proposal submission (i.e., the first two proposals received will be accepted and the remainder will be returned without review). **No exceptions will be made.**

Additional Eligibility Info:

Collaborative proposals: Any proposal submitted in response to this solicitation should be a single submission with support for all collaborators requesting funding from NSF done via subaward. Separately submitted collaborative proposals, as defined in the NSF *Grant Proposal Guide* (Chapter II, Section D.5 Collaborative Proposals), will be returned without review.

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.

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

Important Proposal Preparation Information:

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

COVER SHEET PAGE

1. NSF UNIT CONSIDERATION DESIGNATION

- Select the **program solicitation number** on the Cover Sheet
- Select the "**NSF Unit Consideration**": Either Integration of Computing in STEM Education or Computing Education Knowledge and Capacity Building.
- **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.

2. TITLE

The **Title of the proposal** must be prefixed with a tag that specifies its Project Type followed by a colon, for example:

- Exploratory Integration is "EI:"
- Design and Development is "DD:"
- Conferences and Workshops is "CW:"
- Research on Education and Broadening Participation Projects is "EBP:"
- CS 10K is "CS10K:"

3. HUMAN SUBJECTS BOX:

Mark the **Human Subjects** box as pending, approved, or exempted (with exemption subsection indicated). **This box should not be left blank.** The **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 PAGE

Each proposal must submit a one-page summary of the project. The Project Summary should be written in the third person. As part of NSF's effort to implement automated compliance checking, the project summary section now includes 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 NSF.

(1) Overview:

- Title of the proposed project.
- Name of the lead and any supporting partners or collaborators.
- Indicate the project Track and Type
- Include a brief description of the project vision, goals, and work.
- Include, where applicable, number of teachers to be directly engaged, number of new teachers to be prepared, and number of students (including grade ranges) who will be engaged and/or benefit from the proposed work.

(2) Intellectual Merit:

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

(3) Broader Impacts:

- 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.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

Budget Preparation Instructions:

All projects should expect to participate in NSF PI conferences (both face-to-face and online), and data collection and evaluation processes required by the program. Proposers should budget for one trip to a PI meeting per year.

C. Due Dates

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

  March 28, 2016

  March 14, 2017

  Second Tuesday in March, Annually Thereafter

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://www.nsf.gov/bfa/dias/policy/merit_review/.

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

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

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

A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

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

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

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

2. Merit Review Criteria

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

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

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

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

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

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

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

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

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by 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:

All STEM+C awardees are required to participate in PI meetings and data collection efforts as requested by the program, including dissemination of research findings and project results on MSPNet.org.

Track 1: As new mechanisms emerge in the STEM+C program to aggregate data on project results, awardees will be asked to contribute to such data collection to assess the program, advance knowledge, and inform the field. All STEM+C projects must be linked through the MSPNet.org website.

Track 2: Awardees will be required to keep the CISE Broadening Participation and Education Community apprised of their work by participating in PI/Community meetings and by maintaining up-to-date websites. For CS 10K projects, project websites must be linked through the CS 10K Community of Practice (http://www.cs10kcommunity.org).

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 no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 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:

- Arlene M. de Strulle, DRL/EHR, telephone: (703) 292-8620, email: adestrul@nsf.gov
- Janice Cuny, CNS/CISE, telephone: (703) 292-8900, email: jcuny@nsf.gov
- Kamau Bobb, CNS/CISE, telephone: (703) 292-4291, email: kbobb@nsf.gov
- Catherine Eberbach, EHR/DRL, telephone: (703) 292-4960, email: ceberbac@nsf.gov
- Michael A. Erlinger, EHR/DUE, telephone:(703) 292-7855, email: merlinge@nsf.gov
- David L. Haury, EHR/DRL, telephone: (703) 292-8614, email: dhaury@nsf.gov
- Margret Hjalmarson, EHR/DRL, telephone: (703) 292-4313, email: mhjalmar@nsf.gov
- Christopher Hoadley, EHR/DRL, telephone: (703) 292-7906, email: choadley@nsf.gov
- Paul W. Jennings, EHR/DRL, telephone: (703) 292-5307, email: pjenning@nsf.gov
- Rebecca Kruse, EHR/DRL, telephone: (703) 292-4211, email: rkruse@nsf.gov
- Julio E. Lopez-Ferrao, EHR/DRL, telephone: (703)292-5183, email: jlopezfe@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.

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

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.

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