

Cyberlearning: Transforming Education

Cyberlearning

PROGRAM SOLICITATION

NSF 10-620



National Science Foundation

Directorate for Computer & Information Science & Engineering

Office of Cyberinfrastructure

Directorate for Social, Behavioral & Economic Sciences

Directorate for Education & Human Resources

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

May 14, 2011

Required for Integration and Deployment Projects ONLY

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

January 17, 2011

Exploration Projects (EXP)

January 17, 2011

Design and Implementation Projects (DIP)

July 14, 2011

Integration and Deployment Projects (INDP)

IMPORTANT INFORMATION AND REVISION NOTES

A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), [NSF 11-1](#), was issued on October 1, 2010 and is effective for proposals submitted, or due, on or after January 18, 2011. Please be advised that the guidelines contained in [NSF 11-1](#) apply to proposals submitted in response to this funding opportunity. Proposers who opt to submit prior to January 18, 2011, must also follow the guidelines contained in [NSF 11-1](#).

Cost Sharing: The PAPPG has been revised to implement the National Science Board's recommendations regarding cost sharing. Inclusion of voluntary committed cost sharing is prohibited. In order to assess the scope of the project, all organizational resources necessary for the project must be described in the Facilities, Equipment and Other Resources section of the proposal. The description should be narrative in nature and must not include any quantifiable financial information. Mandatory cost sharing will only be required when explicitly authorized by the NSF Director. See the PAPP Guide Part I: *Grant Proposal Guide (GPG)* Chapter II.C.2.g(xi) for further information about the implementation of these recommendations.

Data Management Plan: The PAPPG contains a clarification of NSF's long standing data policy. All proposals must describe plans for data management and sharing of the products of research, or assert the absence of the need for such plans. FastLane will not permit submission of a proposal that is missing a Data Management Plan. The Data Management Plan will be reviewed as part of the intellectual merit or broader impacts of the proposal, or both, as appropriate. Links to data management requirements and plans relevant to specific Directorates, Offices, Divisions, Programs, or other NSF units are available on the NSF website at: <http://www.nsf.gov/bfa/dias/policy/dmp.jsp>. See [Chapter II.C.2.j](#) of the GPG for further information about the implementation of this requirement.

Postdoctoral Researcher Mentoring Plan: As a reminder, each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. Please be advised that if required, FastLane will not permit submission of a proposal that is missing a Postdoctoral Researcher Mentoring Plan. See [Chapter II.C.2.j](#) of the GPG for further information about the implementation of this requirement.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Cyberlearning: Transforming Education (Cyberlearning)

Synopsis of Program:

Through the *Cyberlearning: Transforming Education* program, NSF seeks to integrate advances in technology with advances in what is known about how people learn to

- better understand how people learn with technology and how technology can be used productively to help people learn, through individual use and/or through collaborations mediated by technology;
- better use technology for collecting, analyzing, sharing, and managing data to shed light on learning, promoting learning, and designing learning environments; and
- design new technologies for these purposes, and advance understanding of how to use those technologies and integrate them into learning environments so that their potential is fulfilled.

Of particular interest are technological advances that allow more personalized learning experiences, draw in and promote learning among those in populations not currently served well by current educational practices, allow access to learning resources anytime and anywhere, and provide new ways of assessing capabilities. It is expected that Cyberlearning research will shed light on how technology can enable new forms of educational practice and that broad implementation of its findings will result in a more actively-engaged and productive citizenry and workforce.

Cognizant Program Officer(s):

- Janet Kolodner, CISE, 1125, telephone: (703) 292-8930, email: jkolodne@nsf.gov
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Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.070 --- Computer and Information Science and Engineering
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources
- 47.080 --- Office of Cyberinfrastructure

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 24 to 34 awards will be made, contingent on the availability of funds.

Anticipated Funding Amount: \$30,000,000 Contingent upon availability of funds, up to \$30 million will be available in FYs 2011 and 2012 combined to fund proposals submitted in response to this solicitation. The intention is to fund 14 to 18 EXPs, 7 to 12 DIPs, and 2 to 4 INDPs. It is expected that another solicitation during FY 2012 will request additional research proposals and Resource Network proposals.

Eligibility Information

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 3

An individual may participate as PI or Co-PI in no more than three (3) proposals: **at most, two (2)** proposals in the Exploratory (EXP) and Design and Implementation (DIP) categories combined, and **at most, one (1)** proposal submitted in response to this solicitation in the Integration and Deployment Project category. **These eligibility conditions will be strictly enforced.** In the event that an individual exceeds this limit, proposals will be accepted based on earliest date and time of proposal submission. Proposals that exceed the limit will be returned without review. **No exceptions will be made.**

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

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

B. Budgetary Information

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

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

C. Due Dates

- **Letter of Intent Due Date(s) (required)** (due by 5 p.m. proposer's local time):
 May 14, 2011
 Required for Integration and Deployment Projects ONLY
- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):
 January 17, 2011
 Exploration Projects (EXP)
 January 17, 2011
 Design and Implementation Projects (DIP)
 July 14, 2011
 Integration and Deployment Projects (INDP)

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: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

Amplifying, expanding, and transforming opportunities people have for learning, and better drawing in, motivating, and engaging young learners are among society's central challenges. Engaging actively as a citizen and productively in the workforce requires understanding a vast variety of concepts and the ability to collaborate, learn, solve problems, and make decisions. Whether learning is facilitated in school or out of school, and whether learners are youngsters or adults, to develop such knowledge and capabilities, learners must be motivated to learn, actively engage over the long term in learning activities, and put forth sustained cognitive and social effort.

Research supported by the *Cyberlearning* program will explore the opportunities for learning made possible by new technologies, how to help learners capitalize on those opportunities, new practices that are made possible by learning technologies, and ways of using technology to promote deep and lasting learning of content, practices, skills, attitudes, and/or dispositions needed for engaged and productive citizenship. Cyberlearning research will marry what is known about how people learn with advances in information and communications technologies to advance understanding of how to cultivate a citizenry that engages productively in learning both in and out of school and throughout a lifetime; and that possesses the knowledge, knowledge building, collaboration and reasoning

capabilities to make informed decisions and judgments about problems ranging from their immediate lives to ethics, privacy, and security concerns to global challenges such as war and peace, economics, health and wellbeing, and the environment.

II. PROGRAM DESCRIPTION

The goals of the Cyberlearning program are:

- To better understand how people learn with technology and how technology can be used productively to help people learn, through individual use and/or through collaborations mediated by technology;
- To better use technology for collecting, analyzing, sharing, and managing data to shed light on learning, promoting learning, and designing learning environments; and
- To design new technologies for these purposes, and advance understanding of how to use those technologies and integrate them into learning environments so that their potential is fulfilled.

The program will fund projects that explore opportunities for learning made possible by new technologies, how to help learners capitalize on those opportunities, new practices that are made possible by learning technologies, and ways of using technology to promote deep and lasting learning of content, practices, skills, attitudes, and/or dispositions needed for engaged and productive citizenship. Every project should therefore seek to answer questions about how to better promote learning, how to promote better learning, or how learning happens in technology-rich environments (including exploring relationships between people and technology that result in productive learning and access provided with technology to learning resources, such as data and scientific information). Each project should also focus, concurrently, on innovative technology design, ways of coherently integrating technologies for learning, and/or the integration of such technology into targeted learning environments. Especially sought are projects in which technology allows the tailoring of learning experiences to special needs and interests of groups or individuals, as well as ways in which technology allows expanding education beyond classroom settings. Proposed research and innovations should be grounded in theories of and the literatures on learning and education.

Proposed cyberlearning technological innovations cannot be explored - much less effect transformations on learning - without being substantively integrated into authentic learning environments, taking into account the affordances (opportunities offered) and constraints of the environment, including the capabilities, needs, and goals of agents in the environment, the resources that are available, and the physical space. Concomitantly, integration of technologies into learning environments may change those environments, prompting a need to understand, predict, and design for those changes. Indeed, it is expected that some technology designs and some ways of integrating technology into learning environments may challenge conventional educational practices.

Research should be situated in one or more of the real-world contexts in which people can learn (including formal or informal environments, traditional and non-traditional environments for learning, and individual and collaborative learning settings). Projects should take into account both theoretical and practical issues, focusing on new directions while, at the same time, taking into account a future in which research outcomes inform implementations on broader and larger scales. It is expected that all projects will advance understanding about how people learn with technology, how to use technology to help people learn, and/or how to use technology to enhance assessment or education practices. A significant amount of effort in all projects will also go into design and implementation of technological innovations that will be iteratively refined over the course of the project based on systematic analysis of formative data.

Projects should make clear the learning domain to be explored (e.g., content, subject matter, topics, skills, practices) and make a research-based case for the promise of the particular technological innovation for promoting learning in this domain. Data should be collected and analyzed to produce evidence of learning outcomes.

PROJECT TEAMS

Projects funded through Cyberlearning will typically be interdisciplinary, with the research team including members with the full range of expertise needed for success, in areas such as human learning, engagement, technology design, technology integration, education, and human-centered computing, as well as expertise in the nature of the targeted learning environment, the technologies being investigated, and carrying out data collection and analysis. The integrated contributions of the members of each proposal team should clearly be greater than the sum of the contributions of each individual member of the team. Since successful collaborative research depends on thoughtful coordination mechanisms, a Collaboration Plan is **required** for all proposals involving multiple investigators. The length of and level of detail provided in the Collaboration Plan should be commensurate with the complexity of the collaboration. Please see *Proposal Preparation Instructions* Section V.A for additional submission guidelines.

The project team should be appropriate for addressing proposed implementation and research goals. Each team is expected to carry out the data collection and analysis necessary to evaluate and refine their innovation and answer their research questions. Teams should be formed accordingly. It is important that proposers establish teams that will help them address issues they anticipate as being important for success. Proposals should make clear the roles of all team members (PIs, supporting investigators, advisors, and others), why the proposed team is an appropriate one, and what expertise each team member brings. Teams should include members who have experience with the learners and environments being targeted and who are expert at relevant engagement and learning issues. Proposers should make clear the challenges associated with assessment and evaluation, robustness and broader usability that they anticipate, and the team members that will help with each of these.

Project proposers should also include on their teams people who can help them plan towards fulfilling the transformational potential of their work, including, as appropriate, those who can help them transition their technology to broad use and those from stakeholder groups who will need to be integrated into the project as innovations move towards scalability, broad dissemination, and continuation over time. As appropriate to the proposed work, project teams should include members who will help in building bridges between communities, helping to make sure the proposed work is appropriate for targeted stakeholders, helping stakeholders and researchers participate in design together, and helping stakeholders understand and come to enthusiastically embrace proposed innovations. It will be appropriate for some projects to include representatives of private-sector or non-profit companies who might be involved with technology transfer.

PROJECT CLASSES

Cyberlearning awards will be made in three categories:

- *Exploration Projects (EXP projects)* explore the proof-of-concept or feasibility of a novel or innovative technology or use of such technology to promote learning. EXP projects might explore how existing technologies can be used to promote learning or explore the affordances of a new or existing technology for learning purposes (the opportunities for engaging in learning that it makes possible).
 - *Project characteristics:* EXP projects should take into account what we know about how people learn and the affordances (opportunities offered) of the technology being investigated.
 - *Formative analyses:* At a minimum, formative analyses should focus on the usability of the technology and effective ways of using the technology to learn and should explore pathways towards engaging learners in the technology's sustained use.
 - *Project team:* Project teams should include, at a minimum, partners with expertise in how people learn, the

targeted domain, the technology/ies being investigated, how to engage and sustain the engagement of learners, and how to collect and analyze data that can inform about usability and effectiveness. Such expertise may reside in a single PI and his/her advisory committee or may be distributed across co-PIs and an advisory committee.

- *Duration and funding:* EXP awards will be funded over a 2 or 3 year period for up to \$550,000 total.
- *Design and Implementation Projects (DIP projects)* will conduct research in the everyday environments in which people spend their lives, e.g., schools, homes, museums, parks, and the workplace. These projects might advance understanding about how to more broadly or productively use technology that holds promise or how to coherently integrate several technological innovations that hold promise.
 - *Project characteristics:* Innovations should take into account not only what is known about how people learn but also how to sustain engagement over long periods of time, and proposers should make clear how their innovation addresses the needs and capabilities of targeted learners (or users). Innovations should also be designed taking into account real-world affordances (opportunities offered) and constraints of the targeted learning environment, including the people and resources that might be available. By later years of the project, leadership roles should be carried out by those who would naturally carry them out in the chosen learning environment.
 - *Formative analyses:* DIP project formative analyses should focus, at a minimum, on the usability of the technology, its effects on learning and/or engagement, and effective ways of integrating use of the technology into activities in the learning environment, including good practices for promoting learning and means of engaging learners in the technology's sustained and effective use. Data collection and analysis should answer questions about the design and efficacy of the proposed innovation as well as questions about learning with technology and the practicality and sustainability of using the technology within the targeted environment.
 - *Project team:* The project team should include the types of partners required for EXP projects and also partners with expertise in the capabilities of the targeted learners, the targeted learning domain, and the constraints and affordances (opportunities offered) of the targeted learning environment. As appropriate, the team should include representatives of stakeholder groups, to help the team plan towards broader use and deployment and/or organizations that will help with technology transfer. The team should also include teachers and/or mentors who would normally take on leadership responsibilities in targeted environments.
 - *Duration and funding:* DIP projects will be funded over a 4 or 5-year period up to a total of \$1,350,000 total.
- *Integration and Deployment Projects (INDP Projects)* should also be carried out in the everyday environments in which people spend their lives, and like other types of projects, they will answer questions about learning and about design of technology. These projects will build on research that has already shown the promise of some technology or set of technologies for promoting learning or advancing our understanding of learning. These projects might advance understanding of how to more broadly or productively use technology that holds promise or how to coherently integrate several technological innovations that hold promise.
 - *Project characteristics:* Proposed innovations should take into account the broad range of issues important to successful learning *and deployment*, including what is known about how people learn, how to engage and sustain engagement among learners, characteristics of the learner population and the targeted learning environments, and the preparation of those who will introduce and take on leadership responsibilities in promoting learning with the technology (e.g., teachers and mentors). These projects may be of several different types:
 - They may advance understanding of how to productively integrate a variety of established technologies to better promote learning or promote better learning in a target population and environment.
 - They may provide guidelines on extending the usage of some promising technology or technologies over a larger variety of learner populations, advancing understanding of how to better address learning needs of different populations.
 - They may provide guidelines on extending the usage of some promising technology or technologies over a larger variety of learning contexts, advancing understanding of learning processes that underlie disciplinary areas or the constraints and affordances (opportunities offered) of different environments for learning.
 - They may combine advances in two or more of these areas.
 - It is expected that technologies will be deployed and evaluated in a large variety of learning environments, that by the end of the project, the technology will be ready for technology transfer and commercialization, and that the guidelines proposed will be broadly applicable beyond the particular technology being deployed. By later years of the project, facilitation of technology use should be done by those who would naturally be the facilitators in the chosen learning environment (e.g., teachers, scout leaders, parents, peers).
 - *Formative analyses:* As for DIP projects, formative analyses should answer questions about usability, learning, effective and sustained use, as well as issues associated with scale-up, sustainability, workforce development, and long-term efficacy (as appropriate).
 - *Project team:* Of necessity, these projects will require broad partnerships, including the types of collaborators listed above and also collaborators who can advise about scale-up and sustainability issues. The team should also include collaborators who can provide guidance in helping facilitators learn to integrate the technology into learning activities. Planning toward scale up will require, for many projects, partnerships with school systems and other potential stakeholder groups. The project team should include the full range of partners needed to consider issues in all relevant areas. These teams should include representatives of stakeholder groups, and it is expected that PIs will negotiate formal collaboration relationships with school districts, museums, or other organizations that would potentially deploy the technology. It will usually be appropriate for these teams include representatives of organizations that will aid technology transfer.
 - *Duration and funding:* INDP awards will be for up to 5 years and up to \$2,500,000 total.

IMPORTANT PROJECT CHARACTERISTICS

The Cyberlearning program will fund a portfolio of projects representing exciting, potentially transformative research with potential for high impact and significant advancement of the state of the art. Proposals should demonstrate that their innovation will offer rich learning experiences for a diverse population of learners. It will be appropriate for many proposals to include the development of innovative curricula or educational materials in addition to proposing technological innovations. Interdisciplinary (including collaborators from the arts and humanities), international, and/or academic-industry collaborations that promise to result in major science or engineering advances are welcome. The program seeks proposals from investigators at a broad range of learning institutions, including faculty at minority-serving and predominantly undergraduate institutions.

A successful research project should be potentially transformative; grounded in existing learning and education research; seek to answer questions about learning with technology; measure learning gains, take into account appropriate elements of the learning ecology in designing its innovation, evaluating its innovation, and answering research questions; include team members with all necessary expertise, including expertise for outreach and dissemination; be aware of potential scalability and sustainability issues; and use appropriate methodologies to evaluate innovations and measure learning gains. Our expectation is that many grants made by this program will seed long-term research enterprises. The transformative potential of proposed projects may be many years out, so proposers should make clear what that potential is and the predicted time horizon.

CYBERLEARNING RESOURCE NETWORK

The Cyberlearning program anticipates creating a future resource network that will provide assessment, technology transfer, dissemination, and evaluation aid to PIs. This resource network will help Cyberlearning PIs collaborate to synthesize findings across the Cyberlearning portfolio, will provide technical assistance to Cyberlearning projects, will help promote national awareness of

research contributions from the Cyberlearning portfolio, and will help build the Cyberlearning community through PI and special interest meetings. All Cyberlearning projects will be required to share their proposals and findings with the resource network and other Cyberlearning PIs, to participate in annual PI meetings and synthesis, and to be responsive to requests for information from other Cyberlearning PIs and from the resource network.

REFERENCES

Bell, Phillip, Bruce Lewenstein, Andrew W. Shouse, and Michael A. Feder (Eds.) (2009). *Learning Science in Informal Environments: People, Places, and Pursuits*. National Academies Press: Washington.

Bransford, John D., Ann L. Brown, and Rodney R. Cocking (2000). *How People Learn: Brain, Mind, Experience, and School*. Washington: National Academies Press.

Donovan, Suzanne and John D. Bransford (2005). *How Students Learn: History, Science, and Mathematics in the Classroom*. Washington: National Academies Press, Washington.

Greeno, J. G., Collins, A. M., and Resnick, L. (1996). Cognition and Learning. In D. Berliner and R. Calfee (Eds.). *Handbook of Educational Psychology* (pp. 15-46). New York: MacMillan.

NSF Taskforce on Cyberlearning (2008). *Fostering Learning in the Networked World: The Cyberlearning Opportunity and Challenge*. National Science Foundation.
http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf08204.

Sawyer, Keith (Ed.) (2006). *Handbook of the Learning Sciences*, Cambridge, MA: Cambridge University Press.

III. AWARD INFORMATION

Contingent upon availability of funds, up to \$30 million will be available in FYs 2011 and 2012 combined to fund proposals submitted in response to this solicitation. The intention is to fund 14 to 18 EXPs, 7 to 12 DIPs, and 2 to 4 INDPs. It is expected that another solicitation during FY 2012 will request additional research proposals and Resource Network proposals.

IV. ELIGIBILITY INFORMATION

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 3

An individual may participate as PI or Co-PI in no more than three (3) proposals: **at most, two (2)** proposals in the Exploratory (EXP) and Design and Implementation (DIP) categories combined, and **at most, one (1)** proposal submitted in response to this solicitation in the Integration and Deployment Project category. **These eligibility conditions will be strictly enforced.** In the event that an individual exceeds this limit, proposals will be accepted based on earliest date and time of proposal submission. Proposals that exceed the limit will be returned without review. **No exceptions will be made.**

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Letters of Intent (required): A Letter of Intent (LOI) is **required** when an investigator (team), plans to submit an **Integration and Deployment Project (INDP)** proposal. LOIs are due on or before May 14, 2011. The LOI must contain (1) a proposed title; (2) the names of Principal Investigators and Co-Principal Investigators, including organizational affiliations and departments; (3) a list of the partnering institutions; (4) a brief synopsis (limited to 100 words) describing the proposed project in sufficient detail to permit selection of reviewers. LOIs will not be used to encourage or discourage the submission of full proposals. They will be used only to help NSF plan for the merit review process, and are nonbinding. Thus, changes may be made between the submission of the LOI and submission of the full proposal.

Letter of Intent Preparation Instructions:

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

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

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF

Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

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

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

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

The following information SUPPLEMENTS (not replaces) the guidelines provided in the NSF Grant Proposal Guide (GPG) and the NSF Grants.gov Application Guide.

Proposal Titles: Proposal titles must begin with an acronym that indicates the categories in which proposals are being submitted, as follows

- Exploration Projects - EXP
- Design and Implementation Projects - DIP
- Integration and Deployment Projects - INDP

The acronym should be followed with a colon then the title of the proposed project. If you submit a proposal as one in a set of collaborative proposals, the title of your proposal should begin with the acronym that indicates the project category, followed by a colon, then "Collaborative Research" followed by a colon, and then the project title. For example, if you are submitting an Exploration Project, the title of each collaborative proposal would be **EXP:Collaborative Research: Project Title**.

Project Summary: The Project Summary must include an explicit description of both the Intellectual Merit and Broader Impacts of the activities proposed, preferably in separate paragraphs titled "Intellectual Merit" and "Broader Impacts".

Project Description: Project Descriptions should include the following sections:

- ***Vision and Goals.***

Describe:

- The theories of learning investigators are drawing from.
- Learning objectives: what learners are expected to learn and how the proposed innovation or its integration into the learning environment is expected to promote that learning.
- The population of learners, including any needs, abilities or interests relevant to achieving the learning objectives.
- How the proposed innovation is matched to the needs, abilities, and interests of targeted learners.
- Because deep understanding and facile capabilities emerge only over long periods of time, how the proposed innovation or its integration into some learning environment is expected to sustain engagement.

- ***Research Plan and Outcomes.***

With appropriate references to the literature, describe the research questions to be answered through your research and a comprehensive research plan to answer them. Make clear the learning domain to be explored (e.g., content, subject matter, topics, skills, practices), and make a research-based case for the promise of the particular technological innovation for promoting learning in this domain. Describe the data to be gathered and analytic approaches to be taken to analyze the data. It is anticipated that technological innovations will be iteratively refined over the course of the project based on analysis of formative data. Describe the formative evaluation methodology you will use, including means to assess learning and engagement. Describe the project outcomes you expect to generate, including products. Discuss how you will collect and analyze data to supply evidence of learning outcomes.

- ***Innovation Outcomes (For DIP and INDP projects ONLY).***

Describe how the proposed innovations and ways of integrating them into the learning environment take into account the environmental and human factors important to learner success (e.g., the cognitive, developmental, affective, and social needs of learners, the cultural milieu in which the learning technologies will be used, and the capabilities and expectations of human agents in the environment). All claims about the appropriateness of the proposed innovation should be supported with evidence from the literature.

- ***Collaboration Plan.***

A Collaboration Plan is **required** for all proposals involving multiple investigators. The length of and degree of detail provided in the Collaboration Plan should be commensurate with the complexity of the proposed project. Collaboration Plans should be included at the end of the Project Description in a section entitled "Collaboration Plan", and up to 3 additional pages are allowed for Collaboration Plans. The Collaboration Plan should describe:

- the specific roles of the project participants in all organizations involved;
- information on how the project will be managed across all the investigators, institutions, and/or disciplines;
- identification of the specific coordination mechanisms that will enable cross-investigator, cross-institution, and/or cross-discipline scientific integration (e.g., yearly workshops, graduate student exchange, project meetings at conferences, use of videoconferencing resources or social media technologies, software repositories, etc.); and
- specific references to budget line items that support collaboration and coordination mechanisms.

Supplementary Documents:

In the Supplementary Documents Section, upload the following information where relevant:

1. *List of Project Personnel and Partner Institutions (Note - In collaborative proposals, only the lead institution should provide this information),*

Provide current, accurate information for all personnel and institutions involved in the project. NSF staff will use

this information in the merit review process to manage conflicts of interest. The list should include all PIs, Co-PIs, Senior Personnel, paid/unpaid Consultants or Collaborators, Subawardees, Postdocs, and project-level advisory committee members. This list should be numbered and include (in this order) Full name, Organization(s), and Role in the project, with each item separated by a semi-colon. Each person listed should start a new numbered line. For example:

1. Mary Smith; XYZ University; PI
 2. John Jones; University of PQR; Senior Personnel
 3. Jane Brown; XYZ University; Postdoc
 4. Bob Adams; ABC Inc.; Paid Consultant
 5. Mary White; Welldone Institution; Unpaid Collaborator
 6. Tim Green; ZZZ University; Subawardee
2. *Post Doctoral Mentoring Plan (if applicable)*

Proposals that include funding to support postdoctoral researchers must include a Postdoctoral Researcher Mentoring Plan as a supplementary document.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

C. Due Dates

- **Letter of Intent Due Date(s) (required)** (due by 5 p.m. proposer's local time):
May 14, 2011
Required for Integration and Deployment Projects ONLY
- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):
January 17, 2011
Exploration Projects (EXP)
January 17, 2011
Design and Implementation Projects (DIP)
July 14, 2011
Integration and Deployment Projects (INDP)

D. FastLane/Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

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

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

- **For Proposals Submitted Via Grants.gov:**

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: <http://www.grants.gov/CustomerSupport>. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

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

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal

preparation requirements. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with the oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal.

A. NSF Merit Review Criteria

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

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

What is the intellectual merit of the proposed activity?

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

What are the broader impacts of the proposed activity?

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

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

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

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

Integration of Research and Education

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

Integrating Diversity into NSF Programs, Projects, and Activities

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

Additional Review Criteria:

For Design and Implementation Projects (DIP) and Implementation and Deployment Projects (IMDP) only, reviewers will be asked to comment on the extent to which the project scope justifies the level of investment requested, and the degree to which the Collaboration Plan (if required) adequately demonstrates that the participating investigators will work synergistically to accomplish the project objectives.

B. Review and Selection Process

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

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

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

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

C. Reporting Requirements

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

Failure to provide the required annual or final project reports, or the project outcomes report will delay NSF review and processing of any future funding increments as well as any pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Janet Kolodner, CISE, 1125, telephone: (703) 292-8930, email: jkolodne@nsf.gov
- Gregg Solomon, EHR, 855, telephone: (703) 292-8333, email: gesolomo@nsf.gov
- Brett Pelham, SBE, 955, telephone: (703) 292-7878, email: bpelham@nsf.gov
- Joan Peckham, OCI, 1145, telephone: (703) 292-7344, email: jpeckham@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.

In addition to the Program Officers identified as points of contact above, the following Program Officers also support the program:

- Pamela Jennings, CISE, (703) 292- 8491, pajennin@nsf.gov, Room 1125
- Lee Zia, EHR, (703) 292-5140, lzia@nsf.gov, Room 835
- Soo-Siang Lim, SBE, (703) 292-7878, slim@nsf.gov, Room 995

NOTE: BECAUSE CYBERLEARNING PROPOSALS ARE DUE CLOSE TO JANUARY 18TH, NEW GPG REQUIREMENTS ARE IN EFFECT. ALL CYBERLEARNING PROPOSALS MUST INCLUDE A DATA MANAGEMENT PLAN OR THEY WILL BE RETURNED BY THE SYSTEM WITHOUT REVIEW. For more information about data management plans, see GPG rules in [Chapter II.C.2.j](#): Special Information and Supplementary Documentation.

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, National Science Foundation Update is a free e-mail subscription service designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the [NSF web site](#).

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

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

NSF receives approximately 40,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

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

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

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

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

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

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
 - Send an e-mail to: nsfpubs@nsf.gov
 - or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

Suzanne H. Plimpton
Reports Clearance Officer
Division of Administrative Services
National Science Foundation
Arlington, VA 22230

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