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Centers for Learning and Teaching (CLT)

National Science Foundation
Directorate for Education and Human Resources
    Division of Elementary, Secondary and Informal Education

Preliminary Proposal Due Date(s) *(optional):*

February 28, 2003

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

April 24, 2003

REVISIONS AND UPDATES

This solicitation is basically unchanged from last year. Changes that have been made include: the elimination of Higher Education Centers; requiring development of strategies for cooperation when proposed Centers include a partner of another larger-scale, NSF-supported project (e.g., Math and Science Partnership); and potential for renewal.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Centers for Learning and Teaching (CLT)

Synopsis of Program:

The Centers for Learning and Teaching (CLT) program focuses on the advanced preparation of science, technology, engineering, and mathematics (STEM) educators, as well as the establishment of meaningful partnerships among education stakeholders, especially Ph.D. granting institutions, school systems, and informal education performers. Its goals are to renew and diversify the cadre of leaders in STEM education; to increase the number of K-16 educators capable of delivering high-quality STEM instruction and assessment; and to conduct research into STEM education issues of national import (e.g., the nature of learning, teaching strategies, and reform policies and outcomes).

Centers for Learning and Teaching

Centers with a programmatic focus on elementary, secondary, or informal education will provide a rich environment that melds research, teacher education, and education practice. Individual Centers may have specific foci (e.g., K-6 science, large-scale assessments, learning of mathematics), but each will address the following three equally important components: (1) renewing and diversifying the cadre of leaders in STEM education, particularly the higher education faculty who educate STEM teachers and professionals in leadership positions at state and district-levels and other education organizations; (2) enhancing the content knowledge and pedagogical skills of current and future elementary and secondary teachers; and (3) supporting research into STEM education issues of national import. The CLT effort builds upon previous activities in the preparation and professional development of teachers and provides opportunities for doctoral and post-doctoral students in the disciplines and in STEM education to acquire the knowledge and skills to educate the next generation of K-12 teachers.

Center proposals must involve partnerships of organizations with a scientific, engineering, and/or educational mission. Among these are two- and four-year colleges and universities, state and local education agencies, professional societies, research laboratories, business and industry, informal science centers, instructional materials development centers, private foundations, and/or other public and private organizations (whether for profit or nonprofit). Each Center must have one or more school district partners (or an appropriate group of schools, e.g., specialized schools), as well as a partner that is authorized to award doctoral degrees in an appropriate STEM education area.

Higher Education Centers

A Higher Education component was added to the CLT program in 2002 and two Higher Education Centers were established. No competition will be held in 2003.

Cognizant Program Officer(s):

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

- 47.076 --- Education and Human Resources

Eligibility Information

- **Organization Limit:** None Specified.
- **PI Eligibility Limit:** None Specified.
- **Limit on Number of Proposals:** An institution or agency may submit only one CLT proposal as the lead institution for a given competition. However, an institution or agency may be a partner on more than one CLT proposal.

Award Information

- **Anticipated Type of Award:** Continuing Grant
- **Estimated Number of Awards:** 2 to 3
- **Anticipated Funding Amount:** $6,000,000 this fiscal year, pending availability of funding - $2,000,000 will be allocated per year per Center - award will be for up to 5 years.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Preliminary Proposals:** Submission of Preliminary Proposals is optional. Please see the full text of this solicitation for further information.
- **Full Proposal Preparation Instructions:** This solicitation contains information that supplements the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full text of this solicitation for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is required (Percentage).
- **Cost Sharing Level/Amount:** 10%
- **Indirect Cost (F&A) Limitations:** None.
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

- **Preliminary Proposals** *(optional)* **:**
  February 28, 2003
- **Full Proposal Deadline Date(s)** (due by 5 p.m proposer's local time):
  April 24, 2003

Proposal Review Information

- **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 Conditions:** Additional award conditions apply. Please see the full text of this solicitation for further information.
- **Reporting Requirements:** Additional reporting requirements apply. Please see the full text of this solicitation for further information.

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I. INTRODUCTION

The Centers for Learning and Teaching (CLT) program is a comprehensive, research-based effort that addresses critical issues and national needs of the science, technology, engineering, and mathematics (STEM) instructional workforce across the entire spectrum of formal and informal education.

The need to replace a large number of educators who are expected to retire over the next decade is widely understood and recent studies have indicated that many inadequately prepared educators enter the profession each year. Recent reports also indicate that the doctoral-level professionals needed to educate the K-12 instructional workforce are in short supply. Replenishing and diversifying the instructional workforce, K-16, and conducting ongoing research related to learning and teaching across the spectrum of these activities are clear national needs.

A growing body of research articulates both the needs of, and possible solutions to, the current state of science, technology, engineering, and mathematics (STEM) education. *What Matters Most: Teaching for America's Future* (National Commission on Teaching and America's Future, 1996) indicates that over 50,000 inadequately prepared teachers enter the teaching profession each year. Indeed, a recent report indicates that in grades 7-12, approximately 33% of mathematics teachers and 20% of science teachers have neither a major nor minor in their field; yet these under qualified teachers teach over 26% of mathematics students and over 16% of science students (Ingersoll, 1999). Moreover, of those teachers who enter with adequate backgrounds, 30% to 50% are likely to leave the profession within five years. Many of those teachers teach science, technology, engineering, and mathematics.

At a time when the K-12 student population is becoming increasingly diverse, the K-12 instructional workforce has not diversified appreciably nor has its ability to provide appropriate instruction for diverse learners increased. It is anticipated that Centers will use varied approaches to diversify the instructional workforce as well as to prepare teachers and faculty to use instructional techniques that enhance the STEM learning of all students.

Recent studies have identified a positive relationship between the use of teaching practices based on national standards and improved student learning (Cohen & Hill, 1998; Kahle, Meece, & Scantlebury, 2000; Klein, Hamilton, McCaffrey, Stecher, Robyn, & Burroughs, 1999). Further, the efficacy of combining professional development with standards-based curriculum is becoming evident (Weiss, Montgomery, Ridgway, & Bond, 1998). There is a need to couple this emerging knowledge base with new and effective ways of preparing future teachers and of providing professional development for current teachers that will produce, as well as retain, effective teachers at the elementary and secondary levels (U.S. Department of Education, 2000).

Doctoral, Post-Doctoral, and Internship Component

A critical CLT component is to provide doctoral, post-doctoral, and intern programs for the broad array of professionals who educate and support the K-12 instructional workforce. These professionals include university scientists, mathematicians and/or engineers who prepare future teachers either in discipline or education courses, local and state supervisors and curriculum coordinators, informal science educators, education researchers, curriculum developers, and assessment and evaluation professionals. Regardless of their future roles, these professionals must master their disciplines; be knowledgeable about current reforms, assessment issues, and effective uses of information technology; and be expert at translating research findings into educational practice. They need to understand national and state standards and know how to connect the goals of mathematics, science, engineering, and technology education to classroom practices that lead to enhanced student achievement. They should understand the research base for both student learning and teacher education and know how to help teachers internalize critical elements of that research into instruction. Moreover, they should be able to relate their expertise to curricular and instructional issues in K-12 STEM education.

Therefore, Centers for Learning and Teaching will educate these professionals in the context of educating the current K-12 instructional workforce. It is anticipated that the partnerships required for each Center will provide learning laboratories for these tasks, and that the work of each Center will complement rather than duplicate other CLTs in meeting national needs.

Teacher Education Component

An evolving body of research on models of effective professional development (e.g., Loucks-Horsley, Hewson, Love, & Stiles, 1998) provides the basis for the Center program teacher education component. Effective pre-

service and in-service teacher professional development will enhance the capacity of the K-12 instructional workforce, add to the knowledge base about effective teacher education, and lead to documented improvement in student achievement. Exploring information technology both to enhance instruction for K-12 students and as a means of providing professional development of, and support for, teachers is a high priority for NSF. Programs addressing teacher professional development, teacher preparation, and/or the induction period for teachers will reflect the research in the pertinent area and include high quality undergraduate courses in science, mathematics, engineering, and technology that are taught through research-based models (e.g., extended inquiry, problem-solving). Other topics of high priority for NSF include: under-prepared and out-of-field teachers; retention of qualified teachers in the profession; strategies for assisting formal and informal educators to meet the needs of all learners; teachers prepared for varied roles within the instructional workforce (e.g., master teachers, department chairs); and opportunities for collaboration with informal science education as well as the education of informal science educators.

Research Component

It is essential that education innovations be built on solid research and that the results of the latest research be disseminated to colleagues and practitioners in a timely and useful manner. Centers for Learning and Teaching are positioned to be a major resource for research and its dissemination. The research undertaken by each Center should address a recognized national need and also connect the doctoral education component to the K-12 teacher education component in a symbiotic manner. The overarching research agenda will not only point to areas of national need, but will also be an indication of the focus of the Center.

The research supported by the CLT program is a critical component of the research effort funded by the Directorate for Education and Human Resources. As a part of that overall effort, researchers at each Center are part of a larger community that contributes to better understandings of learning and teaching of STEM subjects. Opportunities to collaborate across Centers on areas of common interest are afforded. This will create a program-wide research agenda and provide avenues for mutual assistance in furthering this agenda.

II. PROGRAM DESCRIPTION

Program Description Contents

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A. GOALS

The CLT program calls for a systemic approach to the development and enhancement of the instructional workforce (K through graduate school) where professionals are educated in an environment of research and practice. For STEM educators, a Center will provide opportunities to enhance their content knowledge, develop teaching strategies that lead to improved student learning, implement high quality instructional materials, incorporate information technology, and develop skills in using various strategies for assessing student learning. For graduate students, post-doctoral students, and interns, a Center will provide study and research opportunities with the goal of improving learning, teaching, and assessment across the educational continuum.

Although Centers will develop different models to achieve their objectives, all will be expected to address the following equally important goals that are based upon documented national needs.

- Centers will renew and diversify the cadre of national leaders in STEM education. This component will involve providing basic and advanced education for doctoral and post-doctoral students who will specialize in STEM education; who will provide the expertise for large-scale assessment and/or evaluation of educational reform; who will conduct research on STEM teaching and learning; who will develop the next generation of curricular materials; who will become local and state supervisors; and/or who will develop future directions in informal science education.

- Centers will increase significantly the numbers of K-12 STEM educators in formal (schools) and/or informal (museums, zoos, botanical gardens, etc.) settings who have up-to-date content knowledge in their disciplinary area and who are prepared to implement standards-based instruction and new assessment strategies. Further, these educators will be able to use information technology as an aid to student learning.

- Centers will provide substantive opportunities for research into the nature of learning, strategies of teaching, policies of educational reform, and outcomes of standards-based reform.

The three goals are synergistic and inter-related; that is, a Center's research agenda, teacher education activities, and graduate programs should inform one another and focus on the Center's documented national needs.

B. PROJECT CHARACTERISTICS

1. Focus. In order to meet the overarching purposes of this Solicitation, Centers will address all or an appropriate part of the continuum of teacher education and will prepare STEM education professionals through doctoral programs or by providing post-doctoral and internship opportunities for individuals drawn either from a

STEM discipline or from education. The teacher education and graduate/post doctoral components will be developed and carried out through appropriate collaborations between STEM disciplinary and STEM education faculty. Teacher education is likely to be an ongoing activity of the collaborating institutions, and undergraduate and graduate students as well as interns should have opportunities to develop their expertise through interactions with the teachers participating in those activities. The goal of each Center will be on connecting teacher education with the education of those who will be prepared to assume national roles in education. It is anticipated that each Center's efforts will focus on a national need in STEM education and that evidence addressing the scope and urgency of that need will be included in the proposal. Because the CLT program is addressing a broad range of national needs, proposals should include an explanation detailing the uniqueness of the proposed Center vis-a-vis existing Centers. Descriptions of existing Centers can be viewed at www.ehr.nsf.gov/ehr/esie.

The following focus areas are provided as examples _only_, and are not meant to limit the scope of potential proposals. A Center that focuses on the implications of student and community culture for teaching and learning STEM subjects, where the unique attributes of school communities contribute to the design and delivery of education, would add new understandings. A Center that could help research and build the national capacity for technology and engineering education, which being newer disciplines do not have the rich research, developed base, and tradition that mathematics and science education enjoy, would address a critical national issue. A Center that looks critically at the adoption and implementation of instructional technologies (as a medium for learning and teaching) could provide a research foundation for strategies that promote appropriate and best use. A Center could focus on policy issues and new administrative and organizational paradigms to change the structures that support STEM education, including an examination of specialists' roles, determining the balance of STEM expertise needed, and evaluating the methods and benefits of incorporating all appropriate resources. Another Center might investigate research designs, instruments, and methodologies to assess the effectiveness of STEM instructional materials.

2. Coverage. Centers may address mathematics, science, and/or technology education. Each proposal must contain a rationale for the grade band (e.g., K-12, K-6, 7-12) chosen for emphasis. Centers will include educational opportunities for substantial numbers of teachers, administrators, and/or informal science educators as well as programs of study for doctoral and/or post-doctoral students (including those with discipline-based degrees). Proposals should be developed cooperatively among several institutions of higher education and should include some combination of state or local education agencies, community colleges, museums, etc. Such cooperation should leverage the expertise of different institutions. Collaboration is encouraged also with business and industry and with international institutions. Doctoral students, post-doctoral students, and interns might complete different parts of their education at different institutions and/or Centers in order to develop special expertise. Each Center proposal must present a clear plan for recruiting highly qualified candidates into teacher education programs, in-service activities, and graduate and post-doctoral level programs. Recruitment plans will include strategies for expanding the diversity of the STEM education workforce; these strategies should document and build upon existing effective efforts.

3. Doctoral, Post-Doctoral, and Internship Component. Educational opportunities for the STEM instructional workforce are offered by a variety of professionals. They include university teacher educators; scientists, mathematicians, and engineers; curriculum developers; district-level or state-level supervisors and coordinators; lead teachers; informal science educators; assessment specialists; and school administrators (e.g., principals). Programs of study for these professionals will include clearly delineated graduate programs (Ph.D., or Ed.D. Master's programs may be included). Proposals will have clear statements of focus, indicating what backgrounds and experiences will be required for entrance and discuss how the program of study might be adapted for applicants with varying kinds of backgrounds. New ways to involve each Center's collaborative partners, as well as collaborations across Centers as the CLT program evolves are encouraged.

Innovation in graduate programs and post-doctoral education is encouraged as Centers seek to impact both the scope and quality of the STEM education infrastructure. One or more of the following activities are envisioned. First, Centers will provide rich opportunities to conduct research and assessment studies in STEM learning and teaching. Second, for doctoral students, post-doctoral students, and interns coming from scientific, mathematics, and engineering disciplines, there will be in-depth experiences with K-12 STEM teaching, administration, assessment, and curricula. Third, for doctoral students, post-doctoral students and interns with education backgrounds, Centers will provide content courses and other learning experiences related to the Center's particular focus. Centers will provide professionals with opportunities to apply their developing knowledge in realistic settings and provide extensive mentoring to help them develop a broad network of contacts that will provide support after the program of study is complete

4. Teacher Education Component. Centers may address a wide range of issues in teacher education such as: teacher preparation, induction, and internships; teaching out-of-field; licensure programs; alternative certification, master's degree programs; distance education; or some combination of these topics.

Proposals will describe ways that teachers will be assisted in learning content and pedagogy in cooperation with scientists, mathematicians and engineers. Innovative uses of information technology are encouraged. Activities will go beyond standard courses or generic in-service activities, be based on national standards, and include effective pedagogy for adult learning. Innovative ways of providing ongoing support for participants are encouraged in the Centers and may involve collaborations with local or state educational agencies or electronic networks.

5. **Research Component.** Centers will articulate an overarching research agenda that defines the Center focus and provides linkages to the doctoral education component and the K-12 teacher education component. The research agenda should be grounded in the K-12 teacher education component and also contribute to that work. There are well-developed and well-understood means for communicating research results to others in the education research community and these should be used by researchers supported by Centers. Additionally, Centers should devise ways to make the results of their research available to teachers, school administrators, supervisors, and professional societies in ways that can have an impact on practice.

6. Institutionalization. Proposals will include plans for ensuring continuation of critical aspects of the Centers after the period of NSF support. In particular, the support strategies for teacher education need to be institutionalized and critical aspects of graduate programs should be sustained by the collaborating institutions.

7. Evaluation. Evaluation of both the teacher education and graduate, post-doctoral, and internship components that will provide formative and summative feedback to revise and refocus a Center is required. The evaluation plan must describe evidence that will indicate that the Center's goal are met, the data that will be collected, benchmarks that will be measured, methods that will be used in evaluating the project, and the timeline for the evaluation process. It is expected that data will be collected that are appropriate to the goals of the Center and of the CLT program. The evaluation should document the Center's effect on students, teachers, graduate students, faculty, institutional environment, etc.

Each proposed Center must commit to cooperating with an NSF third-party evaluation, including a longitudinal study of impact that will be funded independently by NSF. As part of this evaluation, Centers will be responsible for providing requested data to multiple program evaluators.

8. Dissemination. The proposal must include strategies and plans for communicating the activities and outcomes of the Center to other professionals in the STEM and education communities throughout and after the project.

9. Relationship to other Projects supported by NSF. Centers that propose to include partners from an existing or proposed Math and Science Partnership (MSP) or other large-scale project should carefully delineate plans to avoid duplication of effort and should provide strategies for cooperation. Details should be given for linking the research agenda of the Center to the work of the MSP or other project. Of particular concern is the need for coherence in goals and effort of work in partner school districts. Proposals for a Center that would include a partner that is also a partner in an existing or proposed MSP or other large-scale project must provide evidence that all partners have the necessary capacity to carry out the proposed work of both projects, that the goals and approaches of the two projects are aligned, and that management structures are put in place that will further the goals of both projects without inhibiting the attainment of the goals of either.

References

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III. ELIGIBILITY INFORMATION

The categories of proposers identified in the Grant Proposal Guide are eligible to submit proposals under this program announcement/solicitation.

An institution or agency may submit only one CLT proposal as the lead institution for a given competition. However, an institution or agency may be a partner on more than one CLT proposal.

Center proposals must involve partnerships of organizations with a scientific, engineering, and/or educational mission. Among these are two- and four-year colleges and universities, state and local education agencies, professional societies, research laboratories, business and industry, informal science centers, instructional materials development centers, private foundations, and/or other public and private organizations (whether for profit or nonprofit). Each Center must have one or more school district partners (or an appropriate group of schools, e.g., specialized schools), as well as a partner that is authorized to award doctoral degrees in an appropriate STEM education area.

IV. AWARD INFORMATION

Under this solicitation, awards will be made with an initial commitment of five years and a potential duration of ten years. The progress and plans of each funded CLT will be reviewed by NSF annually, prior to receiving continued NSF support. In the fourth year of operation, the CLT may submit a renewal proposal for continued support, which will undergo merit review. The CLT's achievements and future plans will be evaluated comprehensively. The review will determine if the CLT is meeting the goals and objectives as originally proposed. The CLT performance assessment will be guided by the goals and objectives of the CLT program and the individual goals of the particular CLT.

Centers successful in passing the fourth-year review will be renewed for another five years, commencing at the beginning of the sixth year, and including a two-year phase-out period. Funding levels, in this subsequent period, will be considered at higher levels based on documented success of the Center, a compelling case for the proposed research efforts, and availability of funding. Centers that pass the fourth-year review will continue to be reviewed by NSF at least every 18 months. Centers that do not pass the fourth year review will be phased-out over a one-year period, except that funds may be provided for continued support of the doctoral students appointed under the provisions of the original grant. The NSF will support a CLT for a maximum of ten years.

Support levels for graduate and post-doctoral students and interns may vary depending upon the academic background and/or teaching expertise of applicants. It is envisioned that some advanced students will be paid academic-year stipends (in accordance with local institutional rates) plus tuition and fee waivers, while experienced professionals from teaching or other fields may be remunerated in proportion to their current salaries (up to $35,000/ten months) plus tuition and fee waivers. Professional development activities for

teachers may offer stipends of up to $100 per day; provide tuition and fee waivers for graduate credits; or provide support for substitutes to permit the release of teachers during the school day. Although proposals may request funds for the development of new graduate courses in STEM education, the cost of delivering such courses may not be covered.

All Centers will be required to (1) submit annual reports of progress, (2) participate in a reverse site visit before the third year of funding, and (3) participate in an NSF evaluation of the Centers' program.

A. Proposal Preparation Instructions

Preliminary Proposals *(optional):*

A preliminary proposal is optional, but **strongly recommended** before submission of a full Center proposal. The preliminary proposal must be submitted via FastLane. The Project Description may not exceed six pages and should explain how the proposed Center will address the three goals articulated in the program solicitation, how these goals will be connected, and how the Center will be evaluated and managed. Additionally, identify the anticipated partners and describe their expected roles. No budget is necessary at this time. The project description must be single-spaced written in 12-point type with one-inch margins. Feedback from program staff will be provided to help frame a full proposal. To ensure time to obtain program response, preliminary proposals should be submitted, via FastLane, by 5:00 pm local time on February 28, 2003.

Full Proposal Instructions:

Proposals submitted in response to this program announcement/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/cgi-bin/getpub?gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

Proposers' attention is directed to the recent NSF requirement that the two general review criteria, *Intellectual Merit* and *Broader Impact*, must be explicitly addressed in the project summary and project description of proposals. Additional review criteria described below should be addressed when preparing a proposal. Project Description may not exceed 20 single-spaced pages in 12-point type with one-inch margins. Submission by FastLane is required for both preliminary proposals (preproposals) and full proposals.

Proposers are reminded to identify the program announcement/solicitation number ((03-522)) in the program announcement/solicitation block on the proposal Cover Sheet. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost Sharing:

Cost sharing at a level of 10 percent of the requested total amount of NSF funds is required for all proposals submitted in response to this announcement/solicitation. The proposed cost sharing must be shown on line M on the proposal budget. Documentation of the availability of cost sharing must be included in the proposal.

Only items which would be allowable under the applicable cost principles, if charged to the project, may be included in the awardee's contribution to cost sharing. Contributions may be made from any non-Federal source, including non-Federal grants or contracts, and may be cash or in kind (see OMB Circular A-110, Section 23). It should be noted that contributions counted as cost sharing toward projects of another Federal agency may not be counted towards meeting the specific cost sharing requirements of the NSF award.

All cost sharing amounts are subject to audit. Failure to provide the level of cost sharing reflected in the approved award budget may result in termination of the NSF award, disallowance of award costs and/or refund of award funds to NSF.

Indirect Cost (F&A) Limitations:

None.

Other Budgetary Limitations:

Center awards will be made as continuing grants for up to five years, with the possibility of a five-year renewal. Other budget limitations are identified in section IV, **Award Information.**

C. Due Dates

Proposals must be submitted by the following date(s):

Preliminary Proposals *(optional):*

February 28, 2003

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

April 24, 2003

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this announcement/solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: http://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 announcement/solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this announcement/solicitation.

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. Proposers are no longer required to provide a paper copy of the signed Proposal Cover Sheet to NSF. Further instructions regarding this process are available on the FastLane Website at: http://www.fastlane.nsf.gov

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the

proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

The National Science Board approved revised criteria for evaluating proposals at its meeting on March 28, 1997 (NSB 97-72). All NSF proposals are evaluated through use of the two merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

On July 8, 2002, the NSF Director issued Important Notice 127, Implementation of new Grant Proposal Guide Requirements Related to the Broader Impacts Criterion. This Important Notice reinforces the importance of addressing both criteria in the preparation and review of all proposals submitted to NSF. NSF continues to strengthen its internal processes to ensure that both of the merit review criteria are addressed when making funding decisions.

In an effort to increase compliance with these requirements, the January 2002 issuance of the GPG incorporated revised proposal preparation guidelines relating to the development of the Project Summary and Project Description. Chapter II of the GPG specifies that Principal Investigators (PIs) must address both merit review criteria in separate statements within the one-page Project Summary. This chapter also reiterates that broader impacts resulting from the proposed project must be addressed in the Project Description and described as an integral part of the narrative.

Effective October 1, 2002, NSF will return without review proposals that do not separately address both merit review criteria within the Project Summary. It is believed that these changes to NSF proposal preparation and processing guidelines will more clearly articulate the importance of broader impacts to NSF-funded projects.

The two National Science Board approved merit review criteria are listed below (see the Grant Proposal Guide Chapter III.A for further information). 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 he/she 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 and original 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?

NSF staff 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

The following points will also be used in evaluating all CLT proposals.

Institutional Capacity. What involvement has the proposing institution and its partners had in substantial, high quality STEM education programs? What is the expertise of the faculty and staff who will have involvement with the program? How does it relate to their role in Center activities? What are the plans for institutionalizing the Center?

Project Design. How does the design of the opportunities proposed for teachers and graduate and post-doctoral students reflect current understanding of high-quality professional development? Does the project design allow for differences in background knowledge and experience that participants will bring to the programs? How do scientists and mathematicians contribute to the project?

Impact. What is the likelihood that the activities will produce leaders who can impact STEM education? Will the recruitment and program activities enhance the diversity of the STEM workforce? What is the potential for the project to significantly strengthen the nation's formal and informal STEM instructional workforce, both at the K-12 and higher education levels?

Plan. What is the likelihood that the proposed project will achieve its goals? How will the plan improve the disciplinary content knowledge and instructional skills of STEM teachers and faculty? Is the project informed by research in teaching and learning? Do the proposed activities address and promote equity and diversity in the STEM workforce? Are plans for dissemination and sustainability adequate?

Cooperative Relationships. Are the working relationships among collaborating parties strong? How will collaborations be strengthened as the project progresses?

Research. Are the research findings at the Center used to inform and improve student learning and teaching practice in the Center's specific focal area? Does the research add in a coherent way to the body of knowledge about STEM learning, teaching, assessment, policies, teacher preparation/professional development, uses of information technology, etc.? Will the research findings be disseminated in a comprehensive way? Will the research address issues of equity and diversity in STEM education?

Evaluation. Are the goals of the project clearly stated and measurable? Will the evaluation plan provide data on the impact of the project, on participants' knowledge of content and pedagogy, on the quality of instruction for students or teachers, on the effectiveness of graduate students in improving mathematics and science education, and on the enhancement of K-12 student learning?

B. Review Protocol and Associated Customer Service Standard

All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this announcement/solicitation will be reviewed by 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.

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 Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

In most cases, proposers will be contacted by the Program Officer after his or her recommendation to award or decline funding has been approved by the Division Director. This informal notification is not a guarantee of an eventual 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 date of receipt. The interval ends when the Division Director accepts the Program Officer's recommendation.

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 Division 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.A. 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 (NSF-GC-1); * or Federal Demonstration Partnership (FDP) Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards also are administered in accordance with NSF Cooperative Agreement Terms and Conditions (CA-1). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/home/grants/grants_gac.htm. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/cgi-bin/getpub?gpm. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Website at http://www.gpo.gov.

Special Award Conditions:

Compliance with NSF third-party evaluation, as described under **Project Characteristics** in Section II B.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

Standard annual reports are to be submitted via FastLane. Additional data may also be requested. Such requests will be set as conditions to either the initial award or to continuing yearly funding.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for the PI and all Co-PIs. 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. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, 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.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding this program should be made to:

- John (Spud) Bradley, Section Head, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5091, fax: (703) 292-9044, email: jbradley@nsf.gov
- Michael R. Haney, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5102, fax: (703) 292-9044, email: mhaney@nsf.gov
- Janice M. Earle, Senior Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5097, fax: (703) 292-9044, email: jearle@nsf.gov
- David B. Campbell, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5093, fax: (703) 292-9044, email: dcampbel@nsf.gov
- Monica Neagoy, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-4688, fax: (703) 292-9044, email: mneagoy@nsf.gov
- Susan H. Hixson, Lead Program Director, Higher Education Centers, Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4623, fax: (703) 292-9015, email: shixson@nsf.gov

For questions related to the use of FastLane, contact:

- email: fastlane@nsf.gov
- email: ehr-esie-centers@nsf.gov

IX. OTHER PROGRAMS OF INTEREST

The NSF *Guide to Programs* is a compilation of funding for research and education in science, mathematics, and engineering. The NSF *Guide to Programs* is available electronically at http://www.nsf.gov/cgi-bin/getpub?gp. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after

press time for the *Guide to Programs* will be announced in the NSF E-Bulletin, which is updated daily on the NSF Website at http://www.nsf.gov/home/ebulletin, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's Custom News Service (http://www.nsf.gov/home/cns/start.htm) to be notified of new funding opportunities that become available.

Teacher Professional Continuum, Division of Elementary, Secondary, and Informal Education -- (forthcoming, see http://www.ehr.nsf.gov/esie).

Instructional Materials Development (IMD) -- (http://www.ehr.nsf.gov/esie).

Informal Science Education (ISE) -- Program Solicitation [NSF-03-511] (http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=nsf03511)

Information Technology Experiences for Students and Teachers (ITEST) -- Program Solicitation [NSF-02-147] (http://www.nsf.gov/cgi-bin/getpub?nsf02147).

Math and Science Partnership Program (MSP) -- (https://www.ehr.nsf.gov/msp)

NSF Graduate Teaching Fellows in K-12 Education (GK-12) -- (http://www.ehr.nsf.gov/dge)

Presidential Awards for Excellence in Mathematics and Science Teaching -- (http://www.ehr.nsf.gov/pres_awards/).

Advanced Technological Education (ATE) -- (http://www.ehr.nsf.gov/due).

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities and persons with disabilities to compete fully in its programs. In accordance with Federal statutes, regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF, although some programs may have special requirements that limit eligibility.

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the GPG Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

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

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  (NSF Information Center)**:**

- **TDD (for the hearing-impaired):**   (703) 292-5090 or (800) 281-8749

- **To Order Publications or Forms:**

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

     or telephone: (703) 292-7827

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