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Centers For Learning and Teaching (CLT)

Program Solicitation

NSF 00-148

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
DIVISION OF ELEMENTARY, SECONDARY AND INFORMAL EDUCATION

PREPROPOSAL DEADLINE(S): December 14, 2000

DEADLINE(S): March 15, 2001

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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 is a comprehensive, research-based effort that will address critical issues and national needs of the science, mathematics, engineering and technology (SMET) instructional workforce. Centers will provide a rich environment that melds research, teacher professional development, 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: enhancing the content knowledge and pedagogical skills of the current and future elementary and secondary teachers; rebuilding the infrastructure of higher education faculty who educate SMET teachers; and supporting research into relevant aspects of SMET education. The CLT effort builds upon previous activities in the preparation and professional development of teachers and provides opportunities for graduate students and post-doctorates in the disciplines and in SMET education to acquire the knowledge and skills to educate the next generation of K-12 teachers. Combined with new approaches in assessment, research on learning, curriculum and materials development, and research-based instructional methodologies, the CLT program will build the intellectual infrastructure needed to ensure high-quality, standards-based learning opportunities in SMET for all students. Awards will be made in two categories: full Center proposals and developmental proposals. (See **DEVELOPMENTAL GRANT** Section.)

Cognizant Program Officer(s):

- Dr. John Bradley, for full proposals, Division of Elementary, Secondary, and Informal Education, Room 885, telephone: 703.292-8620, e-mail: ehr-esi-centers@nsf.gov.
- Dr. Michael Haney, for developmental proposals, Division of Elementary, Secondary, and Informal Education, Room 885, telephone: 703.292-8620, e-mail: ehr-esi-centers@nsf.gov.

Applicable Catalog of Federal Domestic Assistance (CFDA) Number:

- 47.076 --- Education and Human Resources

ELIGIBILITY INFORMATION

- **Organization Limit:** This solicitation for Centers for Learning and Teaching requires the collaboration of different types of institutions and agencies involved in K-12 science, mathematics, engineering and technology (SMET) education. At least one partner must be a K-12 school district, and one partner must have authorization to grant appropriate doctoral degrees. Other partners may include two- and four-year colleges and universities, state and local education agencies, professional societies, research laboratories, private foundations, informal science education centers, business and

industry, and other public and private organizations (whether for profit or nonprofit). Any of these partners may serve as the administrative home for a Center.

- **PI Eligibility Limit:** None
- **Limit on Number of Proposals:** An institution may only be the administrative home for one Center proposal. An institution may be involved in only one developmental proposal.

AWARD INFORMATION

- **Anticipated Type of Award:** Center proposals - Continuing Grant; developmental proposals - Standard grants
- **Estimated Number of Awards:** 7-9 awards for Centers; 8-12 awards for developmental grants
- **Anticipated Funding Amount:** Approximately $16 million will be allocated for newly funded Centers and $2 million for developmental grants in FY 2001, pending availability of funding.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Guidelines

- **Proposal Preparation Instructions:** Supplemental Preparation Guidelines
    - The program announcement/solicitation contains supplements to the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full program announcement/solicitation for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is required (Percentage)
- **Cost Sharing Level/Amount:** 10 % (applies only to Center proposals)
- **Indirect Cost (F&A) Limitations:** None
- **Other Budgetary Limitations:** Center awards will be made as continuing grants for up to five years. Developmental grants are for up to $200,000. Other budget limitations are identified in section IV, Award Information.

C. Deadline/Target Dates

- **Letter of Intent Due Date(s):** None
- **Preproposal Due Date(s):** December 14, 2000
- **Full Proposal Due Date(s):** March 15, 2001

D. FastLane Requirements

- **FastLane Submission:** Full Proposal Required
- **FastLane Contact(s):**
    - Jeff Harris, Science Education Analyst, EHR, Elementary, Secondary and Informal Education, Room 885, telephone: 703-292-8620, e-mail: jsharris@nsf.gov.

PROPOSAL REVIEW INFORMATION

- **Merit Review Criteria:** National Science Board approved criteria. Additional merit review considerations apply. Please see the full program announcement/solicitation for further information.

AWARD ADMINISTRATION INFORMATION

- **Award Conditions:** Additional award conditions apply. Please see the program announcement/solicitation for further information.
- **Reporting Requirements:** Additional reporting requirements apply. Please see the full program announcement/solicitation for further information.

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I. INTRODUCTION

A growing body of research articulates both the needs of, and possible solutions to, the current state of science, mathematics, engineering and technology (SMET) education. The study, *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 do not have either a major or minor in their field; yet these underqualified 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% will leave the profession within five years. Many of those teachers teach science, mathematics, and technology.

Further, 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. For example, although research indicates that minority students' attitudes about and/or perceptions of science are positively influenced by teaching strategies that involve interactive, stimulating laboratory experiences in a non-competitive environment (Brownstein & Destino, 1994; Griffard & Wandersee, 1998; Teel, Debruin-Parecki, & Covington, 1998), too often lecture and factual memorization are the instructional strategies used. 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 SMET learning of all students.

Recent studies have also 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.

An evolving body of research on models of effective professional development (e.g., Loucks-Horsley, Hewson, Love, & Stiles, 1998) provides the basis for the first Center program component, professional development activities for teachers. The desired type of 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 professional development, and lead to documented improvement in student achievement. Exploring 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. The research on successful teacher professional development is applicable in teacher preparation, as well as during the induction periods for new teachers; programs addressing those areas will reflect this research and include high quality undergraduate courses in science and mathematics that are taught through research-validated models (e.g., extended inquiry, problem-solving). Likewise, Centers might address the issue of under-prepared and out-of-field teachers; focus on the retention of qualified teachers in the profession; develop strategies for assisting formal and informal educators to meet the needs of all

learners; prepare teachers for varied roles within the instructional workforce (e.g. master teachers, department chairs); or address opportunities for collaboration with informal science education as well as the education of informal science educators.

Another critical CLT component is to provide graduate, post-doctoral, and intern programs for the broad array of professionals who educate and support the K-12 instructional workforce. These professionals form the infrastructure of SMET education. They include university scientists and mathematicians 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 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 and science education to classroom practices that lead to enhanced student achievement. They should understand the research base for both student learning and professional development 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 SMET 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.

II. PROGRAM DESCRIPTION

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 SMET teachers, 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 that will improve 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.

(1) Centers will increase significantly the numbers of K-12 SMET educators in formal (schools) and/or informal (museums, zoos, botanical gardens, etc.) settings who have current 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.

(2) Centers will rebuild and diversify the human resource base that forms the national infrastructure for SMET education. This component will involve providing basic and advanced education for graduate and post-doctoral students who will specialize in SMET education (either in disciplinary or education departments); who will provide the expertise for large-scale

assessment and/or evaluation of educational reform; who will conduct research on SMET teaching and learning; who will develop the next generation of curricular materials; or who will develop future directions in informal science education.

(3) 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.

PROJECT CHARACTERISTICS

Focus. In order to meet the overarching purposes of this solicitation, Centers will address the range of teacher education and will increase the capacity of the infrastructure by preparing SMET education professionals through doctoral programs or by providing post-doctoral and internship opportunities for individuals drawn either from a discipline or from education. The focus of each Center will be on connecting professional development for teachers with the education of those who will be prepared to assume national roles in education. It is anticipated that each Center's focus will address a national need in SMET education and that evidence addressing the scope and urgency of a particular need will be included in the proposal. Professional development for teachers 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.

Coverage. Centers may address mathematics and/or science and also may include a focus on technology education. Each proposal must contain a rationale for the grade band (e.g., K-12, K-6) chosen for emphasis. Centers will include long-term and short-term professional development 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 international institutions. Doctoral, post-doctoral students and interns might complete different parts of their education at different institutions and/or Centers in order to develop special expertise. For example, one type of Center might focus on developing high quality K-12 science curricular materials and bring together representatives from school districts, informal science centers, curriculum developers, undergraduate, graduate, and post-doctoral students, and science faculty to design, develop, and field-test new materials. Another type of Center might focus on research, evaluation, and assessment through emphasis on the graduate education of educational psychologists and psychometricians who focus on the learning and assessment of mathematics and/or science and who are needed to evaluate large-scale reform projects such as the SMET systemic initiatives. Another Center might choose to address the retraining of those who already hold a doctorate (or the equivalent) in science, mathematics, and engineering and who have particular interest in SMET education.

Each Center proposal will 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 SMET education workforce; these strategies should document and build upon existing effective efforts.

Teacher Professional Development. Centers may address a wide range of issues in teacher professional development such as: teacher preparation, induction and internships, teaching out-of-field, licensure programs, alternative certification, master degree programs, distance education, or some combination.

Proposals will describe ways that teachers will be assisted in learning content and pedagogy especially through the support of scientists and mathematicians and/or through innovative uses of information technology. 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.

Graduate, Post-Doctoral and Internship Program. A wide variety of people provide professional development for the SMET instructional workforce. They include university teacher educators, scientists and mathematicians, 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 (M.S., Ph.D. or Ed.D.). 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 quantity and quality of the SMET education infrastructure. One or more of the following activities are envisioned. First, Centers will provide rich opportunities to conduct research and assessment studies in SMET learning and teaching. Second, for doctoral and post-doctoral students and interns coming from scientific and mathematics disciplines, there will be in-depth experiences with K-12 SMET teaching, administration, assessment, and curricula. Third, for doctoral, 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.

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 professional development of teachers need to be institutionalized and critical aspects of graduate programs should be sustained by the collaborating institutions.

Evaluation. Evaluation of both the teacher professional development and graduate, post-doctoral, and internship components that will provide formative and summative feedback to revise and refocus a Center is required.

The teacher professional development component will provide documentation of changes in teachers' content knowledge, changes in the quality of instruction delivered to K-12 students, and student achievement data. For activities at the graduate and post-doctoral levels, there should be documentation of the impact on participants' knowledge, on the quality of teacher professional

development delivered, and on the effectiveness of participants' ability to work in K-12 SMET education in formal or informal settings. It is anticipated that the Centers will involve faculty, as well as the doctoral and post-doctoral students, in the internal evaluation of all Center activities.

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 the evaluator.

DEVELOPMENTAL GRANTS

As a special component of this solicitation, developmental grants will be awarded to institutions of higher education, informal science centers, or K-12 districts that require a planning period to develop solid collaborations and/or strengthen institutional capacities, to assess regional and/or national needs in SMET education, or to prepare for a special focus. Developmental grants will be awarded on a one-time only basis, and it is anticipated that each will result in the submission of a full proposal. The core purpose of a developmental grant is to develop institutional capacity and partnerships. It is anticipated that minority-serving, rural, and comprehensive institutions of higher education as well as community colleges, informal science education agencies, and school districts will serve as lead institutions in developmental proposals.

One institution, or a group of institutions, may submit a proposal for a developmental grant, but institutions may not be involved in more than one proposal. Preproposals and cost-sharing are not required for developmental grants. However, a full budget must be included in the proposal. Proposals must not exceed 10 pages and should not include appendices. In order to inform the community and to improve the CLT solicitation, final reports will include (1) a description of the need addressed, (2) evidence that the institutional capacity has been enhanced, and (3) documentation that partnerships have been established and/or strengthened.

Developmental grants will be made for up to $200,000, depending upon the extent of the development needed, the number of institutions involved, and the scope and/or complexity of the need addressed. Developmental grants will be made for a period of 12 to 18 months. All proposals for developmental grants should be submitted no later than 5:00 PM local time, March 15, 2001. They should be clearly marked in the program solicitation block on the NSF Form 1207 by DP (developmental proposal).

REFERENCES

Brownstein, E.M., & Destino, T. (1994, April). *Scenes from a science classroom: An enrichment program experience.* Paper presented at the annual meeting of the American Education Research Association, New Orleans. (ERIC Document Reproduction Service No. ED 375 001)

Cohen D. K., & Hill, H. C. (1998). *State policy and classroom performance: Mathematics reform in California* (CPRE Policy Brief). Philadelphia, PA: Consortium for Policy Research in Education.

Griffard, P.B., & Wandersee, J.H. (1998, April). *Challenges to meaningful learning among African-American females at an urban science high school.* Paper presented at the annual meeting of the National Association for Research in Science Teaching, San Diego, CA. (ERIC Document Reproduction Service No. ED 417 977)

Ingersoll, R. M. (1999, March). The problem of underqualified teachers in American secondary schools. *Educational Researcher*, 28(2), 26-37.

Kahle, J. B., Meece, J., & Scantlebury, K. (In Press). *Urban African-American middle school science students: Does standards-based teaching make a difference?* Journal of Research in Science Teaching.

Klein, S., Hamilton, L., McCaffrey, D., Stecher, B., Robyn, A., & Burroughs, D. (1999, May). *Teaching practices and student achievement: Report of first-year findings from the "Mosaic" study of systemic initiatives in mathematics and science.* Los Angeles, CA: Rand Corporation.

Loucks-Horsley, S., Hewson, P. W., Love, N., & Stiles, K. E. (1998). *Designing professional development for teachers of science and mathematics.* Thousand Oaks, CA: Corwin Press.

National Commission on Teaching and America's Future (1996). *What matters most: Teaching for America's future.* Report of the National Commission on Teaching and America's Future. Woodbridge, VA, 22194-5239

Teel, K. M., Debruin-Parecki, A., & Covington, M.V. (1998). Teaching strategies that honor and motivate inner-city African-American students: A school/university collaboration. *Teaching and Teacher Education*, 14, 479-495.

Weiss, I. R., Montgomery, D. L., Ridgway, C. J., & Bond, S. L. (1998, December). *Local systemic change through teacher enhancement: Year three cross-site report.* Chapel Hill, NC: Horizon Research, Inc.

III. ELIGIBILITY INFORMATION

Center proposals must involve partnerships of organizations with a scientific and/or educational mission. Among these are two- and four-year colleges and universities, state and local education agencies, professional societies, research laboratories, 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, as well as a partner that is authorized to award doctoral degrees in an appropriate area. Where possible, Centers should have collaborative relationships with NSF systemic initiatives (i.e., state, urban, rural, local). An institution may only be the administrative home for one Center proposal. An institution may be involved in only one developmental proposal. Cost-sharing is required for all proposals (except developmental grant proposals) submitted in response to this solicitation at a level of 10% of the requested total amount of NSF funds.

IV. AWARD INFORMATION

Under this solicitation, Center proposals may be submitted for up to five years of funding. 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 $30,000/ten months) plus tuition and fee waivers. Professional development activities for teachers may offer stipends of up

to $75 per day, or provide tuition and fee waivers for graduate credits, or 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 SMET education, the cost of delivering such courses may not be covered.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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 Web Site at: http://www.nsf.gov/cgi-bin/getpub?nsf012. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

Preproposal Requirements: A preproposal is required for submission of a full Center proposal. The narrative may not exceed 6 pages and should be prepared and submitted in accordance with the general guidelines contained in the GPG. A signed cover page is not necessary for a preproposal.

A preproposal is not required for submission of a developmental proposal.

Full proposal narrative may not exceed 20 pages.

Submission by FastLane is required for preproposal, full Center, and developmental proposals.

Proposers are reminded to identify the program announcement/solicitation number (NSF 00-148) in the program announcement/solicitation block on the proposal Cover Sheet (NSF Form 1207). 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 at a level of 10 % (applies only to Center proposals) 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 (NSF Form 1030). 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. Developmental grants are for up to $200,000. Other budget limitations are identified in section IV, Award Information.

C. Deadline/Target Dates

Proposals submitted in response to this announcement/solicitation must be submitted by 5:00 PM, local time on the following date(s):

March 15, 2001

A preproposal is not required for submission of a developmental proposal.

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this Program 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 1-800-673-6188.

Submission of Signed Cover Sheets. The signed copy of the proposal Cover Sheet (NSF Form 1207) must be postmarked (or contain a legible proof of mailing date assigned by the carrier) within five working days following proposal submission and be forwarded to the following address:

National Science Foundation
DIS – FastLane Cover Sheet
4201 Wilson Blvd.
Arlington, VA 22230

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.

Proposals will be reviewed against the following general review criteria established by the National Science Board. Following each criterion are potential considerations that the reviewer may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Each reviewer will be asked to address only those that are relevant to the proposal and for which he/she is qualified to make judgements.

What is the intellectual merit of the proposed activity?
How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative 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?

Principal Investigators should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both of the above-described NSF merit review criteria. NSF staff will give these elements careful consideration 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

As elaboration to the above considerations, the following points will be used in evaluating CLT proposals.

- **Institutional Capacity.** What involvement has the proposing institution and its partners had in significant, high quality SMET education programs? What is the expertise of the faculty and staff who will have significant 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 SMET education? Will the recruitment and program activities enhance the diversity of the SMET workforce? What is the potential for the project to significantly strengthen the Nation's formal and informal SMET 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 SMET teachers and faculty?

- **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 SMET learning, teaching, assessment, policies, teacher preparation/professional development, uses of informational technology, etc.? Will the research findings be disseminated in a comprehensive way? Will the research address issues of equity and diversity in SMET 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?

A summary rating and accompanying narrative will be completed and signed by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are mailed 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.

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 Mail Review followed 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.

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 will be able to tell applicants whether their proposals have been declined or recommended for funding within six months for 95 percent of proposals. The time interval begins on the proposal deadline or target date or from the date of receipt, if deadlines or target dates are not used by the program. 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 its 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 NSF brochure, program guide, 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 web site at http://www.nsf.gov/home/grants/grants_gac.htm. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 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, (NSF 95-26) available electronically on the NSF web site 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 web site at http://www.gpo.gov.

Special Award Conditions
Compliance with NSF third-party evaluation, as described under "Project Characteristics" in Section II.

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 submitted via FastLane, with the possibility of requests for additional data. 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. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

NSF has implemented an electronic project reporting system, available through FastLane. 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 should be made to the Centers For Learning and Teaching Program:

- Dr. John Bradley, for full proposals, Division of Elementary, Secondary, and Informal Education, Room 885, telephone: 703.292-8620, e-mail: ehr-esi-centers@nsf.gov.
- Dr. Michael Haney, for developmental proposals, Division of Elementary, Secondary, and Informal Education, Room 885, telephone: 703.292-8620, e-mail: ehr-esi-centers@nsf.gov.

For questions related to the use of FastLane, contact, Jeff Harris, Science Education Analyst, EHR, Elementary, Secondary and Informal Education, Room 885, telephone: 703-292-8620, e-mail: jsharris@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 web site 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.

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 (unless otherwise specified in the eligibility requirements for a particular program).

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 program announcement/solicitation for further information.

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, FIRS at 1-800-877-8339.

The National Science Foundation is committed to making all of the information we publish easy to understand. If you have a suggestion about how to improve the clarity of this document or other NSF-published materials, please contact us at plainlanguage@nsf.gov.

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; 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 applicant 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 needing information as part of the review process or in order to coordinate programs; 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," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

Pursuant to 5 CFR 1320.5(b), an agency may not conduct or sponsor, and a person is not required to respond to an information collection unless it displays a valid 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 this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne Plimpton, Reports Clearance Officer, Information Dissemination Branch, Division of Administrative Services, National Science Foundation, Arlington, VA 22230, or to Office of Information and Regulatory Affairs of OMB, Attention: Desk Officer for National Science Foundation (3145-0058), 725 - 17th Street, N.W. Room 10235, Washington, D.C. 20503.

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