RESEARCH ON LEARNING AND EDUCATION (*ROLE*)

Program Announcement

NSF 00-17

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
DIVISION OF RESEARCH, EVALUATION AND COMMUNICATION

Deadline Dates

Preliminary Proposals:	**March 1**	**September 1**
Formal Proposals:	**June 1**	**December 1**

NATIONAL SCIENCE FOUNDATION

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SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Name: Research on Learning and Education (ROLE)

Short Description/Synopsis of Program:

This program seeks to capitalize on important developments in a variety of fields related to human learning and to education. It will support research along a four-quadrant continuum that includes 1) brain research as a foundation for research on human learning; 2) fundamental research on behavioral, cognitive, affective and social aspects of human learning; 3) research on science, mathematics, engineering and technological (SMET) learning in formal and informal educational settings; and 4) research on SMET learning in complex educational systems. *ROLE* seeks gains at the intersections of these areas, where issues arising from research and educational practice can be reconciled, and hypotheses generated in one area may be tested and refined in others. The *ROLE* Program aims to advance the knowledge base in and across these multidisciplinary areas.

Cognizant Program Officers: Dr. Anthony Kelly, telephone 703.306.1650, email aekelly@nsf.gov, Dr. Nora Sabelli, telephone: 703.306.1650, email: nsabelli@nsf.gov, Dr. Larry Suter, telephone: 703.306.1650, email: lsuter@nsf.gov, Dr. Elizabeth VanderPutten, telephone: 703.306.1650, email evanderp@nsf.gov.

Applicable Catalog of Federal Domestic Assistance (CFDA) No.: 47.076 — Education Grants

ELIGIBILITY

♦ Limitation on the categories of organizations that are eligible to submit proposals: **None**

♦ PI eligibility limitations: **None**

♦ Limitation on the number of proposals that may be submitted by an organization: **None**

AWARD INFORMATION

♦ Type of award anticipated: **Standard and Continuing Grants**

♦ Number of awards anticipated in FY 2000: **20-30 awards**

- Amount of funds available: **Approximately $8 million will be available for new awards for this initiative in FY 2000, depending on the availability of funding.**

- Anticipated date of initial awards: **September 2000**

PROPOSAL PREPARATION & SUBMISSION INSTRUCTIONS

- **Proposal Preparation Instructions**

  - Letter of Intent requirements: **None**

  - Preliminary proposal requirements: **March 1 and September 1**

  - Full proposal requirements: **June 1 and December 1**

  - Proposal preparation instructions: **Standard NSF Grant Proposal Guide instructions**

  - Supplemental proposal preparation instructions: **None**

  - Deviations from standard (GPG) proposal preparation instructions: **None**

- **Budgetary Information**

  - Cost sharing/matching requirements: **None**

  - Indirect cost (F&A) limitations: **None**

  - Other budgetary limitations: **None**

- **FastLane Requirements**

  - FastLane proposal preparation requirements: **FastLane use required for both preliminary proposal and full proposal**

  - FastLane point of contact: FastLane Technical Support between 8 a.m. to 6 p.m. EST at telephone 703-306-1142 or e-mail fastlane@nsf.gov

- **Deadline/Target Dates**

- Preliminary Proposal Deadline: **5:00 p.m. local time, March 1 and September 1**
- Full Proposal Deadline   **5:00 p.m. local time, June 1 and December 1**

PROPOSAL REVIEW INFORMATION

♦ Merit Review Criteria: **Standard National Science Board approved criteria**

AWARD ADMINISTRATION INFORMATION

♦ Grant Award Conditions: **GC-1 or FDP III**

♦ Special grant conditions anticipated: **None**

♦ Special reporting requirements anticipated: **None**

INTRODUCTION

Preface: the context for research on learning and education (*ROLE*)

Advances in many related fields have transformed research on learning and education in recent years. These advances have contributed to an emerging, multidisciplinary science of learning that bears directly on the educational and research goals of the National Science Foundation (NSF). New opportunities promise to advance educational research and practice, and to improve the level, quality, and accessibility of science, mathematics, engineering, and technology (SMET) education.

With these opportunities in mind, the Directorate for Education and Human Resources (EHR) is broadening the scope of its research program, calibrating the program's development through a continuing process of consultation with researchers and educators. Research on Learning and Education (*ROLE*) is a transitional program. It seeks to integrate advances across methodologies and disciplines within a single, stable program. Development of the continuing program will be guided in part by theoretical papers and workshops, Principal Investigator meetings, and discussions in other venues addressing current needs and opportunities. This participatory development process is crucial for maintaining the proper balance between expanding the frontiers of knowledge and creating conditions that ensure sustainable implementation of improved educational practices.

The process will also continue to benefit from the results of earlier research programs that NSF has supported and major studies such as the 1997 report by the President's Committee of Advisors in Science and Technology, *Report to the President on the Use of Technology to Strengthen K-12 Education in the United States*, and the 1999 National Research Council report, *How People Learn: Brain, Mind, Experience, and School.*

EHR Responsibilities and Activities

The EHR Directorate has primary responsibility for NSF's efforts to provide national and research-based leadership in SMET education. In its actions responding to this broad responsibility, EHR pursues goals to improve the quality and availability of SMET education (see inset). To reach these goals, the Directorate sponsors programs in the Divisions of Elementary, Secondary, and Informal Education (ESIE), Undergraduate Education (DUE), Graduate Education (DGE), Human Resource Development (HRD), the Experimental Program to Stimulate Competitive Research (EPSCoR), and Educational System Reform (ESR), in addition to the research support EHR primarily provides through the REC Division. For a complete list of EHR programs, consult http://www.ehr.nsf.gov/prog.asp. For a complete list of programs across NSF, consult http://www.nsf.gov/pubs/2000/nsf002/apx_a.htm.

Foundation support for education-related research has increased in recent years (e.g. the programs in *Learning and Intelligent Systems* (LIS, NSF97-18), *Research on Education, Policy and Practice* (REPP, NSF 96-138), *Research Studies in Systemic Reform* announcement (NSF 99-95), and the *Interagency Education Research Initiative* (IERI,

NSF 99-84)). ROLE subsumes those activities formerly covered by Research Studies in Systemic Reform, REPP, and LIS. IERI, which focuses on large-scale studies and the scaled transfer of research findings to educational practice, will continue as a multi-agency initiative with its own announcement.

PROGRAM DESCRIPTION

The *ROLE* Program helps advance progress toward the EHR goals through the development and application of new scientific knowledge. Goals for the *ROLE* Program are:

1. To discover and to describe neural, cognitive, affective, and conceptual learning processes required for life-long SMET learning;

2. To understand how prekindergarten through secondary teacher and post-secondary faculty content knowledge and pedagogy relate to the implementation that innovative and effective curricula, materials, and assessments require;

3. To develop research-based learning tools, pedagogical approaches, and materials that enhance SMET education at all levels;

4. To reevaluate the overall curriculum structure (including selection, ordering, and priorities of topics) to enhance SMET education at all levels;

5. To develop and to refine new education research and evaluation methods;

6. To increase the research capacity of the field, especially the development of new researchers and research-oriented education practitioners;

7. To collect and to analyze data and to use data to inform researchers, decision-makers and the general public;

8. To understand the factors that enhance the full participation of all Americans in the SMET enterprise and the approaches that can increase this participation; and

9. To increase the knowledge of learning, teaching and organizational models that lead to substantial and large-scale improvement in the efficiency, efficacy, and cost-effectiveness of the United States educational system.

Goals for EHR

Source: *NSF Guide to Programs (NSF 99-4)*

- Making high quality science and mathematics education available to every child in the United States;
- Ensuring that the educational pipelines to careers in science, mathematics, engineering and technology yield a diverse, well-educated technical workforce adequate for the needs of the United States;
- Ensuring that the instructional workforce has the disciplinary and pedagogical skills necessary to provide an excellent education to every student in science and mathematics;
- Ensuring that those who select careers in science, mathematics or engineering have the best professional education at the undergraduate and graduate levels; and
- Promoting scientific literacy and public interest in and awareness of scientific and technological developments through high quality informal science education and college courses for nonspecialists.

ROLE: **Areas of Concentration**

A balanced portfolio to achieve these goals will span what may be viewed as a continuum framework. The purpose of the framework is to help enable the integration of research on learning into its broader educational and social context. The *ROLE* Program will support research across a four-quadrant science of learning continuum that includes:

1. Brain research as a foundation for research on human learning;

2. Fundamental research on behavioral, cognitive, affective and social aspects of human learning;

3. Research on SMET learning in formal and informal educational settings; and

4. Research on SMET learning in complex educational systems.

Each of these quadrants constitutes a broad research area, with its own distinct characteristics and historical foundations. The section " Sampling of Research Areas That May Be Considered in *ROLE* Proposals" illustrates some of the research areas that characterize the quadrants in this framework. In addition, the quadrants significantly overlap and inform one another. *ROLE* seeks gains at the intersections of these areas, where issues arising from research and educational practice can be reconciled, and hypotheses generated in one area may be tested and refined in others. The *ROLE* Program aims to advance the knowledge base in and across these multidisciplinary areas. Indeed, EHR expects that NSF's other directorates will participate in the review of proposals to the *ROLE* Program.

Each quadrant will be treated as a concentration area for purposes of discussion and appropriate proposal review. Proposers preparing a submission that addresses one of the four areas should keep the overlap among them in mind to facilitate the review process. Proposers may also prepare submissions that cut across two or more of the four areas. **All proposals should specify the quadrant(s) to which they are responding in their abstract and summary statements.** All applicants should carefully review the section *Common Themes Across the ROLE Concentration Areas*.

I.   Brain Research as a Foundation for Research on Learning

The effort to understand intelligence and learning, and their relationship to the human brain, is one of the most fundamental and profound journeys of basic science. Converging lines of research have begun to reveal how relatively simple forms of learning affect the brain's structure, activity, and organization, from infant development through adulthood. Cognitive processes – such as reading a word or analyzing a visual scene – are beginning to be understood in terms of neural systems. Discoveries of this nature are influencing our understanding of behavior and cognition. Neuroscience investigations at a wide range of spatial and temporal scales can contribute to fundamental understanding of the complex process of human learning.

ROLE will support a limited number of theoretical studies focused on human learning that help frame advances in areas that may include but are not limited to biological neural networks, computational neuroscience, functional imaging, neuroplasticity, and adaptive systems. The *ROLE* Program seeks proposals for workshops and similar activities that will inform and gather advice from relevant scientific communities in these areas. <u>The goal of these workshops and theoretical studies will be to help conceptualize long-term trajectories by which multidisciplinary research anchored in the neuroscientific foundations of learning can inform educational practice</u>. Most projects that NSF supports in this quadrant will be limited in nature, and allow for an exploratory approach to working with various research communities toward this goal.

An important aspect of these activities and subsequent research funding is to build capacity in neuroscience related to complex learning and education. This includes increasing the number of multidisciplinary investigators who address human learning in their research.

II.   Fundamental Research on Behavioral, Cognitive, Affective, and Social Aspects of Learning

The goal of this quadrant is to enhance the multidisciplinary understanding of the foundations of human learning. NSF seeks proposals that formulate compelling and innovative bridges from cognitive science either to brain research (Quadrant I) or to research on learning in educational settings (Quadrant III). *ROLE* strongly encourages multidiscipline, institutional, and researcher and educator collaborations. A sample of areas of interest includes:

- Modeling of cognitive processes and mapping of models to brain function in the context of human learning;

- Sociological, ethnographic, anthropological, economic, and organizational studies that address the special characteristics of educational environments; and

- Understanding the cognitive and pedagogical implications of new scientific and technological advances.

Several Quadrant I and Quadrant II questions that focus on human learning have in recent years found support in the Learning and Intelligent Systems (LIS) component of the NSF-wide Knowledge and Distributed Intelligence (KDI) Program. NSF held the final competition for LIS proposals in FY 1999. ROLE seeks *education-related* collaborative proposals that continue either LIS or LIS-related research. (The most recent LIS Program Announcement appears at http://www.nsf.gov/pubs/1999/nsf9929/nsf9929.htm#lis.)

III.   Research on SMET Learning in Educational Settings

Many educational approaches, curriculum materials, and technological tools to mediate the learning process have been developed without the benefit of a strong research

foundation. In some instances, this is because the appropriate research does not exist. In other cases, this is because of insufficient exchange of information and knowledge between research, development and implementation communities. This has resulted in a time lag between what is known and what can be implemented, and the retention in educational materials of concepts that have been revised by scientific research (e.g., strict functional dichotomies between the left and right hemispheres of the brain).

A principal expectation for research related to this quadrant is to provide a stronger base to support sustained improvement in science and mathematics educational practice in settings such as classrooms, informal learning sites (including the home), and technological learning environments (e.g. non-academic technological education). Another expectation is to bridge research and educational practice. Such bridges should facilitate principled improvement of educational practice, and direct research efforts toward critical, practice-derived issues.

In particular, *ROLE* seeks proposals that bridge research on science and mathematics learning with areas of educational practice associated with programs in the EHR Divisions and that include collaborations with investigators funded under such programs. (***ROLE* is not an evaluation program; rather, it discourages submission of proposals whose primary purpose is to conduct evaluations of other projects, including activities that EHR Divisions support.)** A catalog of current EHR programs and abstracts of funded awards appear at http://www.ehr.nsf.gov/prog.asp. Additionally, NSF welcomes proposals that formulate compelling and innovative bridges either to fundamental research on human learning (Quadrant II) or to research on science and mathematics learning in complex educational settings (Quadrant IV). Particular attention should be paid to research designs that will produce cumulative, reproducible, sustainable and scalable results and that explore the curricular implications of scientific and technological advances.

IV.   Research On SMET Learning In Complex Educational Systems

Few organizational studies have addressed the phenomena that drive successful transformation of educational systems into entities that optimize student learning. The development of theoretical frameworks, analytical tools, and deeper empirical understanding of these phenomena is essential to the advancement of educational policies and large-scale strategies to improve SMET learning.

The term "systems" refers to traditional entities (e.g. pre-K-12 school systems, post-secondary organizations and authorities), and to broader views of educational stakeholders, including research scientists, and policy makers, and the ways in which stakeholders interact.

ROLE welcomes proposals that study existing large-scale reform experiments, in which foundational research on human learning or research in components of SMET educational practice are embedded in a sustainable and scalable way in actual complex systems of practice. Such systemic studies may include uncovering the mechanisms for the transfer of fundamental research findings in scientific disciplines to innovation-based

SMET curriculum reform, the adoption of experimental SMET learning technology prototypes into scaled and sustained educational practice, or the conditions for widespread increases of the participation of learners in scientific research. Other questions for which research findings are sought include core issues in systemic reform at all levels of education, and systemic reform issues that require better theoretical specification than is currently available. Eligible research includes studies that involve testable hypotheses, studies that challenge current systemic reform strategies, design experiments, and other research methods such as quasi-experiments, testbeds, longitudinal data, and national and international comparisons.

A sample of research areas of potential interest includes:

- Studies of systemic reform strategies, including predictive modeling, frameworks for systemic change, and evaluations of costs and effectiveness;

- "Innovation flow" and organizational mechanisms conducive to policy changes and sustained, coherent improvements in systemwide practice;

- Interactions among accountability reforms, curricular reforms, textbook adoptions, technologies, teacher professional development opportunities, revised graduation requirements, schedules, and other reforms;

- Modeling of large educational systems and their evolution in terms of multilevel adaptive systems, with possible theoretical parallels to issues and research in the first three Quadrants.

Common Themes Across the *ROLE* Concentration Areas

Balance: The Foundation expects to support a balance of proposals across the four concentration areas. (As noted later, however, the exploratory approach to Quadrant I support will likely result in a smaller share of overall ROLE funding for it under this Announcement.) It also expects to support a balance of **innovation in methodology** with the use of **mature or maturing methodologies** and a balance in the development of **new technology** with **mature or maturing technologies**.

Methodology: The development of appropriate research methodologies is, in itself, a significant product of EHR-funded research. Therefore, competitive proposals must take special care to keep abreast of relevant advances in research methodologies and theoretical models. Rapid transitions from hypothesis generation to hypothesis testing are appropriate. The *ROLE* Program seeks proposals that capitalize on the development of new instrumental, computational or statistical methods, models, and tools of observation and analysis. Such development enhances qualitative and quantitative methods available to **build rigorous, cumulative, reproducible, and usable** findings across *ROLE*'s four areas of concentration.

Technology: In order to improve quality, accessibility and efficiency of SMET education, *ROLE* promotes the use of new and evolving information technologies. *ROLE*

seeks collaborative research and development proposals on those technologies. Such support will be possible where the potential for significant advance exists. Interdisciplinary research and systems development that can lead to significant advances in understanding of education and learning, from empirical research to theory development to classroom practices, are eligible.

Research Transfer: ROLE seeks to accelerate the integration of high-quality research findings into SMET educational practice. Proposals that determine the character, limitations and potential of the use and adoption of research findings are eligible. As the body of well-grounded, reproducible, cumulative and usable findings emerges, proposers should consider what mechanisms efficiently bring those findings into productive public or scholarly debate and educational practice.

Human Capacity Development: ROLE seeks proposals that help to stimulate the quality and preparation of the SMET educational research and practice communities. Such projects may help promote the efficacy of mechanisms for recruiting, training, and supporting beginning researchers (including graduate students, faculty in early career stages, and crossover researchers from the academic sciences to industry or from industry to education). Requests for travel awards, preparation of critical literature reviews, and workshops to develop collaborations and to communicate results among the appropriate constituencies that contribute to the educational base should be discussed with a *ROLE* Program Officer prior to submission.

Finally, the Foundation recognizes the need for *ROLE* to serve as an opportunity for exceptional or unanticipated approaches based upon specific EHR goals or needs. *EHR welcomes high-risk proposals that demonstrate a compelling potential to advance the goals of the Directorate and the Foundation.*

SAMPLING OF RESEARCH AREAS THAT MAY BE CONSIDERED IN *ROLE* PROPOSALS

Brain Research as a Foundation for Research on Learning
   Primarily topics for workshops and limited theoretical papers

- Factors affecting the resilience of normal learning processes under stress and other adverse conditions.

- Representations underlying knowledge acquisition, in biological, psychological, and computational terms. Intermediate representations in multistage learning processes.

- Influence of attentional, emotional, social, and environmental factors on learning.

- Biological information processing and priority-setting in natural physical and social environments.

- Brain development and the relation between cognitive skills and developmental strategies.

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- Comparative neural and behavioral effects of different training strategies and pedagogical sequences.
- Functional imaging of neural activity during different types of knowledge and skill acquisition.
- Neural plasticity at the micro level, its variability, and its relation to learning at the macro level.
- Individual learning and development, and their relation to group experiences.

Fundamental research on behavioral, cognitive, affective and social aspects of learning.

- Human cognition and perception in learning, including concept formation, acquisition, and change; informal learning and attention mechanisms; spatial representations and manipulations; reasoning; development of increasingly complex models and representations.
- Social influences on learning, group behavior and cultural influences on development, theoretical frameworks, adaptation of educational change strategies to new environments.
- Psychology and physiology of speech production and auditory perception in the context of learning, relation between verbal and visual development and abstract concept learning.
- Cognitive factors that predict or enhance the resilience of normal learning under adverse conditions,
- Learning in practiced and novel domains, and the integration of existing knowledge with new information.

Research on Learning in SMET Educational Settings

SMET Teaching and Learning

- Understanding the conditions and pedagogy under which more learners master advanced science and mathematics.
- Interplay of concepts, theory and facts in the integration of new knowledge with prior knowledge and development of the individual's active knowledge base and problem-solving ability.
- Factors that enable access, participation, persistence, and diversity in the SMET enterprise.
- Theories of teacher competence; detailed understandings of teachers' knowledge, goals, beliefs, etc.; development of robust and flexible teacher pedagogical content knowledge.
- Effects of visualization of science processes on students' abilities to develop and use concepts.
- Research on the adult learning factors that underlie breakthrough improvement in the development of instructional and professional competencies.

- Empirical studies on the conditions for effective SMET pedagogies in educational practice.
- Conditions for productive interactions of teachers, students, and scientists in classroom activities.
- Qualities of excellent teachers.
- Experimentation on educational and scientific innovations that can significantly improve teaching and learning of increasingly complex science content through the use of appropriate cognitive or technology methodologies.

SMET Curriculum

- Experiments in curriculum structure: topic selection; technological methods; ordering of topics, developmental stages appropriate for learning increasingly complex concepts.
- Foundations for the use of design as a driver for SMET and vocational learning
- Networking of research communities in SMET education to help create a body of work that aggregates across studies, across curricular areas, and across grade levels.
- Teachers as codevelopers of curriculum, and impact of this role on their effectiveness and growth.

SMET Assessment

- Learner self-assessment in computer-based instruction.
- Development of conceptual learning assessment instruments and their effective utilization.
- Predictive models of individual learning change and growth; individual learning trajectories.
- Exploration of new approaches to assessment of mathematics and science learning.
- Creation of robust measures of achievement that could serve as benchmarks for advanced meta-analyses.

Research on learning in complex educational systems

- Approaches to multiscale modeling, information and innovation flow, and emergent system behaviors in analysis of educational system dynamics.
- Economic and policy implications of K-16 budgeting practices and interplay with vendor strategies.
- Processes of change in the colleges of education that graduate SMET teachers.
- Tests of comprehensive theory-based interventions with rigorous methodologies among well-defined populations, whose outcomes can be analyzed and aggregated across projects.
- Role of parents and community organizations in sustained SMET learning.

- Strategies for self-directed learning by teachers; for teachers as researchers on their own practice; for teachers as participants in large-scale experiments based in their classrooms.
- Distributed and Web-based learning models, and learning outside classrooms.

ELIGIBILITY

Proposals may be submitted by any organization eligible for NSF support. Synergistic collaboration among researchers and collaboration or partnerships with other educational institutions (including schools or school systems), scientific organizations, industry or government laboratories is encouraged when appropriate. Due to the limited availability of funds, prospective applicants are strongly urged to contact one of the program officers listed at the end of this document for guidance.

AWARD INFORMATION

ROLE awards may be funded up to 3 years and will generally range from $100,000 to $1,800,000. Depending on the availability of funding, between 20 and 30 proposals may be selected for support per funding cycle. *ROLE* will consider planning, workshop and exploratory research grants for up to one year and up to $100,000 each.

No predetermined allocation for funding applies across the four-Quadrant continuum. It is likely, however, that under this transitional Announcement, support for Quadrant I-related research will be less than one-fourth of total available funding.

PROPOSAL PREPARATION & SUBMISSION INSTRUCTIONS

Special Notice on Small Grants For Exploratory Research (SGER)

Proposers interested in submitting projects for under $100,000 and whose goals are either organizing meetings or workshops, increasing the research capacity in the field, or exploring high-risk, high-gain ideas, may submit proposals under this Announcement. REC will also consider unsolicited proposals for Small Grants for Exploratory Research (SGER). Details for SGER grant proposals, which may be submitted at any time, appear in the *Grant Proposal Guidelines (NSF 00-02)*. Individuals interested in submitting a SGER proposal should discuss their ideas with a *ROLE* Program Officer prior to submission.

Preliminary Proposal Preparation Instructions

Preliminary proposals are required prior to submission of full proposals on or before the preliminary proposal deadline date. (Note: Full *ROLE* proposals that have been declined may be resubmitted without further preliminary proposal submission. For *ROLE* resubmissions, please contact a Program Officer for preliminary proposal requirement waiver. Additionally, a full proposal may follow a preliminary proposal that has been

submitted within one year of the full proposal deadline.) Preliminary proposals should include the following:

1. A Cover Sheet (NSF Form 1207); the Project Title should begin with the preface "ROLE Preproposal:"; the dollar request field should remain blank.

2. A Project Summary Form that provides a brief synopsis of the proposed project and that specifies the Quadrant(s) to which the proposal responds.

3. A Project Description of five to seven pages; The Project Description describes the essential features and anticipated impact of the proposal. In particular, proposers should:

   - Describe the research issue(s) proposed, the proposed methods of investigation, and the guiding, relevant theoretical frameworks

   - Describe the strategic contribution of the research to NSF's education goals and specific research goals;

   - Identify the project team of scholars, learners, teachers, faculty and scientists;

   - Describe the advanced technologies, if any, that will be developed or that the project will use; and

   - Outline the conjectures or hypotheses that are to be tested, the proof-of-concept evidence that will be gathered, and the anticipated impact on different learner populations;

   - Provide on the final page of the Project Description a summary of estimated project costs.

4. Provide brief biographical sketches (not to exceed one page each) for key project personnel.

No other forms should be submitted for preliminary proposals. Signed and separately mailed cover sheets are not required for preliminary proposals. NSF program staff members review preliminary proposals; where appropriate, the review will include staff from other NSF divisions or external experts. Review of preliminary proposals, and communication back to the proposer, may take as long as five weeks. The preliminary proposal review is not a factor in the review of a subsequent full proposal. NSF typically returns funding decisions within six months of formal proposal submission.

Proposal Preparation Instructions

Proposals submitted in response to this program announcement should be prepared and submitted in accordance with the general guidelines contained in the *Grant Proposal Guide (GPG)*, NSF 00-02. The complete text of the GPG (including electronic forms) is available on the NSF Web site at: http://www.nsf.gov/bfa/cpo/policy/grants.htm. 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.

Proposers are reminded to identify the program announcement number (NSF 00-17) in the program announcement/solicitation block on the NSF Form 1207, "Cover Sheet for Proposal to the National Science Foundation." Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

Proposal Due Dates

Submission dates: Both preliminary and full proposals MUST be submitted by 5:00 p.m., local time, on the specified deadline dates, using NSF's FastLane electronic proposal submission system. A proposal that is submitted after the due date will be returned without consideration. For full proposals only, copies of the signed proposal Cover Sheet (NSF Form 1207) must be submitted in accordance with the instructions identified below. Cover Sheets should be forwarded to the following address and must be postmarked within 5 working days of the deadline date. Signed and separately mailed cover sheets for full proposals should be sent to:

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

A full proposal may not be processed until the complete proposal (including signed Cover Sheet) has been received by NSF.

FastLane Requirements.

Proposers are required to prepare and submit both preliminary and full proposals using the NSF FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at https://www.fastlane.nsf.gov/a1/newstan.htm.

Submission of Signed Cover Sheets for Full Proposals. The signed paper copy of the proposal Cover Sheet (NSF Form 1207) should be forwarded to NSF within five working days following proposal submission in accordance with FastLane proposal preparation and submission instructions referenced above.

PROPOSAL REVIEW INFORMATION

A.   Merit Review Criteria

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 merit 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 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 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?

PIs should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both NSF merit review criteria. NSF staff will give these factors 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 learner 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 -- are 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.

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 will be reviewed by a panel of external expert reviewers. In some circumstances, however, some proposals will be reviewed by mail review or a combination of mail and panel review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. A 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 his or her supervisor, 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 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 an 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 Officer does so at its own risk.

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 (DGA).   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.

B. Grant Award Conditions.

An NSF grant consists of: (1) the award letter, which includes any special provisions applicable to the grant 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 grant conditions, such as Grant General Conditions (NSF GC-1)[*] or Federal Demonstration Partnership Phase III (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. Electronic mail notification is the preferred way to transmit NSF grants to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

C. <u>Reporting Requirements.</u>

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.

Within 90 days after expiration of a grant, 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 a new electronic project reporting system, available through FastLane, which 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. Reports will continue to be required annually and after the expiration of the grant, but PIs will not need to re-enter information previously provided, either with the proposal or in earlier updates using the electronic system.

Effective October 1, 1999, PIs are required to use the new reporting system for submission of annual and final project reports.

D. <u>New Awardee Information.</u>

If the submitting organization has never received an NSF award, it is recommended that the organization's appropriate administrative officials become familiar with the policies and procedures in the NSF *Grant Policy Manual* which are applicable to most NSF

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[*] These documents may be accessed electronically on NSF's Web site at <http://www.nsf.gov/>. 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. The GPM also is available in paper copy by subscription from the Superintendent of Documents, Government Printing Office, Washington, DC 20402. The GPM may be ordered through the GPO Web site at: http://www.gpo.gov. The telephone number at GPO for subscription information is 202.512.1800.

awards. The "Prospective New Awardee Guide" (NSF 99-78) includes information on: Administrative and Management Information; Accounting System Requirements and Auditing Information; and Payments to Organizations with NSF Awards. This information will assist an organization in preparing documents that NSF requires to conduct administrative and financial reviews of an organization. The guide also serves as a means of highlighting the accountability requirements associated with Federal awards. This document is available electronically on NSF's Web site at: <http://www.nsf.gov/cgi-bin/getpub?nsf9978>.

CONTACTS FOR ADDITIONAL INFORMATION

General inquiries should be made to the **Research on Learning and Education Program**. Dr. Nora Sabelli, Sr. Program Director, telephone: 703.306.1650, email: nsabelli@nsf.gov.   Dr. Elizabeth VanderPutten, Program Director, telephone: 703.306.1650, email evanderp@nsf.gov; Dr. Anthony Kelly, Program Director, telephone 703.306.1650, email aekelly@nsf.gov. For questions related to use of FastLane, contact FastLane Technical Support between 7 a.m. to 6 p.m. EST at telephone 703-306-1142 or e-mail fastlane@nsf.gov.

OTHER PROGRAMS OF INTEREST

The NSF Guide to Programs is a compilation of funding for research and education in science, mathematics, and engineering. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter. Many NSF programs offer announcements concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices listed in Appendix A of the GPG. Any changes in NSF's fiscal year programs occurring after press time for the Guide to Programs will be announced in the NSF Bulletin, available monthly (except July and August), and in individual program announcements. The Bulletin is available electronically via the NSF Web Site at http://www.nsf.gov.   The direct URL for recent issues of the Bulletin is http://www.nsf.gov/od/lpa/news/publicat/bulletin/bulletin.htm Subscribers can also sign up for NSF's Custom News Service to find out what funding opportunities are available.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Grantees 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 or contact the program coordinator at (703) 306-1636.

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 regarding NSF programs, employment, or general information. TDD may be accessed at (703) 306-0090 or through FIRS on 1-800-877-8339.

We want all of our communications to be clear and understandable. If you have suggestions on how we can improve this document or other NSF publications, please email 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 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.

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: Reports Clearance Officer;

Information Dissemination Branch, DAS; National Science Foundation; Arlington, VA 22230.

YEAR 2000 REMINDER

In accordance with Important Notice No. 120 dated June 27, 1997, Subject: Year 2000 Computer Problem, NSF awardees are reminded of their responsibility to take appropriate actions to ensure that the NSF activity being supported is not adversely affected by the Year 2000 problem. Potentially affected items include: computer systems, databases, and equipment. The National Science Foundation should be notified if an awardee concludes that the Year 2000 will have a significant impact on its ability to carry out an NSF funded activity. Information concerning Year 2000 activities can be found on the NSF web site at http://www.nsf.gov/oirm/y2k/start.htm.

Catalogue of Federal Domestic Assistance (CFDA) No.: # 47.076 – Education Grants
OMB No.: 3145-0058
NSF 00-17