

Teacher Professional Continuum (TPC)

Program Solicitation

NSF 04-568

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National Science Foundation

Directorate for Education and Human Resources

Division of Elementary, Secondary and Informal Education

Division of Undergraduate Education

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

May 25, 2004

Required for categories (A) Research Studies and (B) Resources for Professional Development; not required for category (C) Conferences and Symposia

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

September 10, 2004

Deadline applies to Categories A and B. Proposals for category C may be submitted at any time, but are expected to be submitted at least one year in advance of the planned event.

REVISIONS AND UPDATES

1. Three categories of proposals are solicited: (A) Research Studies, (B) Resources for Professional Development, and (C) Conferences and Symposia.
2. The Research Studies category includes two levels of projects: Exploratory Projects that are limited in scope and intended to encourage new researchers and Research Projects of larger scope and duration.
3. The Resources for Professional Development category includes two levels of projects: Proof-of-Concept Projects focused on pilot-scale efforts in developing and testing prototype materials or tools and Full Development Projects to create new resources, demonstrate their effectiveness, and provide for national dissemination.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Teacher Professional Continuum (TPC)

Synopsis of Program:

The Teacher Professional Continuum (TPC) program addresses critical issues and needs regarding the recruitment, preparation, induction, retention, and life-long development of K-12 science, technology, engineering, and mathematics (STEM) teachers. Its goals are to improve the quality and coherence of teacher learning experiences across the continuum through research that informs teaching practice and the development of innovative resources for the professional development of K-12 STEM teachers. The program supports Research Studies, Resources for Professional Development, and Conferences and Symposia.

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

- 47.076 --- Education and Human Resources

Eligibility Information

- **Organization Limit:** None Specified.
- **PI Eligibility Limit:** None Specified.
- **Limit on Number of Proposals:** None Specified.

Award Information

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 25 to 35
- **Anticipated Funding Amount:** \$28,000,000 FY 2005 pending availability of funds

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

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

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required.
- **Indirect Cost (F&A) Limitations:**

Indirect costs are not allowed on participant support costs.

- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

- **Preliminary Proposals (required) :**
May 25, 2004
Required for categories (A) Research Studies and (B) Resources for Professional Development; not required for category (C) Conferences and Symposia
- **Full Proposal Deadline Date(s)** (due by 5 p.m. proposer's local time):
September 10, 2004
Deadline applies to Categories A and B. Proposals for category C may be submitted at any time, but are expected to be submitted at least one year in advance of the planned event.

Proposal Review Information

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

Award Administration Information

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

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I. INTRODUCTION

The Teacher Professional Continuum (TPC) program is the Foundation's major programming effort supporting the full continuum of professional development from recruitment, preparation, and induction, through the life-long development and retention of K-12 science, technology, engineering, and mathematics (STEM) teachers. A major focus of TPC is the synthesis and further advancement of a compelling body of research that will both inform and strengthen STEM teacher effectiveness and classroom instruction.

In addressing the full continuum, the TPC program solicits submission of proposals in the following three categories:

- A. Research Studies
- B. Resources for Professional Development
- C. Conferences and Symposia

The TPC program reflects a cycle of discovery, innovation and application (adapted from the Rand Mathematics Study Panel, 2002) that includes:

- Developing and testing new theories and knowledge about teaching and learning;
- Designing and developing tools, materials and methods;
- Designing, implementing, and documenting interventions;
- Synthesizing and interpreting results and identifying new insights and questions; and
- Conducting research on problems of learning, teaching, and implementation.

TPC focuses on four elements of this cycle, with potential impact on a fifth. Research Studies involve developing and testing theories and knowledge of teaching and learning; synthesizing and interpreting results; and conducting research on issues related to learning within the teacher professional continuum, teaching, and the impact of research findings on the practice of teaching. Resources for Professional Development involve the design and development of tools, materials, and methods. Conferences and Symposia provide a venue for identifying new insights and questions. Ultimately TPC will provide the knowledge base for designing, implementing, and documenting interventions. The TPC portfolio will demonstrate the cycle of innovation through its emphasis on advancing research on learning and teaching in ways that inform practice across the

teacher professional continuum.

NOTE: The term "professional development" as used in this solicitation refers to both preservice and inservice teachers.

II. PROGRAM DESCRIPTION

CONTEXT

The foundation of the TPC program rests on documented national needs and recommendations from recognized experts in STEM education, education research, and disciplinary research. Learning to teach may be regarded as a continuum of professional experiences (Bransford, Brown, & Cocking, 1999; National Research Council, 2000; Wilson, Floden, & Ferrini-Mundy, 2001). This continuum begins with a teacher's own K-12 educational experiences and progresses through teacher preparation programs, induction, professional development, and other life and professional activities. These experiences constitute a complex, life-long learning process that, in reality, often lacks coherence and continuity. Teacher preparation programs and professional development experiences especially are often disjointed and disconnected from classroom practice (Garet, Porter, DeSimone, Birman, & Yoon, 2001; Goodlad, 1990). This disconnect adversely impacts the teaching and learning of science, technology, engineering, and mathematics (STEM) in K-12 classrooms. The process of teacher learning should be a coherent series of related events. It is with this vision of a comprehensive, coherent, and integrated sequence of teacher life-long learning that the TPC program has been conceptualized and defined.

The STEM instructional workforce is rapidly changing due to teacher shortages, attrition (teachers leaving the field for other careers), migration (teachers moving to different schools) and retirement. Ingersoll (2001) refers to this constant change as a "revolving door." It impacts all of our nation's school districts and has an especially dramatic effect on communities serving low-income children (Darling-Hammond, 2000). The consequences of the revolving door are severe, forcing schools to hire large numbers of unqualified teachers every year. Out-of-field teachers are assigned responsibility to teach STEM disciplines even though they are neither comfortable with, nor prepared to teach, these content areas. Some schools eliminate STEM courses (e.g., high school physics) due to teacher shortages. The ultimate consequence is a detrimental impact on student achievement (National Commission on Teaching and America's Future, 2002).

An inadequately prepared STEM workforce presents a major challenge to any effort that seeks to ensure accountability. For states and districts to meet increasing expectations on teacher quality and student learning, strong candidates must be attracted to, and prepared for, the STEM teaching profession. Simply increasing the number of teachers entering the field will not – in and of itself – suffice in meeting requirements for qualified teachers (Darling-Hammond, 2000; Ingersoll, 2001; National Commission on Teaching and America's Future, 2002). It is essential (1) to address organizational sources of low teacher retention (Ingersoll, 2001) by building systems and developing resources that support teachers' efforts in promoting STEM learning for all students, and (2) to strengthen the STEM teaching profession (Hinds, 2002) by providing professional development that improves teaching practice in large numbers of classrooms (Elmore, 1997). To further develop an instructional workforce capable of meeting the content and instructional challenges of STEM classrooms, our nation must strengthen the supporting infrastructure, increasing numbers of qualified teacher leaders and teacher mentors, of qualified STEM professional development providers, and of university faculty dedicated to high-quality at all intervals on the STEM teacher professional continuum. Meeting these challenges requires STEM education research across the professional continuum envisioned by the TPC program.

MISSION AND GOALS

The mission of the TPC program is to advance quality STEM teaching that will lead to gains in students' understanding of STEM concepts and processes, STEM literacy, and pursuit of advanced study and STEM careers. This mission rests on a triadic foundation:

- expanding research on effective STEM teaching and teacher learning;
- developing professional resources for STEM teachers and those who educate them; and
- strengthening the infrastructure that supports the STEM teaching profession.

In support of this mission, the goal of the TPC program is to develop a research agenda that informs STEM teaching practice and its connection to improved learning for all students through the following objectives:

- advancing the knowledge base on the preparation, induction, enhancement, and retention of STEM teachers, and on the strategies that strengthen and diversify the STEM teaching workforce;
- fostering effective collaborations between the communities of STEM education and disciplinary researchers, practitioners, and others contributing to STEM education;
- promoting scientifically based research that examines teacher learning of STEM content and pedagogy, and assesses the subsequent impact of this learning on practice;
- encouraging research on effective professional development experiences that enhance STEM teachers' pedagogical content knowledge and its alignment with classroom practice;
- identifying, researching, and piloting effective models and systems that enhance STEM teacher learning and improve teaching practice;
- understanding, through research, those instructional practices that enhance student learning in STEM disciplines;
- developing innovative resources, materials, tools, and ideas, for preparing and supporting STEM teachers and those who educate them; and
- disseminating research findings, effective models, and field-tested resources to national audiences of practitioners, administrators, researchers, policy makers, education faculty, and/or STEM disciplinary faculty.

To improve the quality of STEM teaching in particular, and to strengthen the STEM teaching profession in general, it is essential (1) to develop the knowledge, resources and infrastructure needed to recruit, prepare, support, enhance, and sustain STEM teachers throughout the professional continuum, as well as (2) to create a coherent continuum of professional experiences that enable STEM teachers to grow in their profession and to contribute to research on the knowledge base that informs their practice (National Research Council, 2000). The TPC program will support projects that address these critical needs.

The success of the TPC program, therefore, requires meaningful and appropriate collaborations among classroom teachers; STEM research faculty and education faculty; education researchers; state, district, and/or school administrators; and assessment and evaluation experts. It is expected that practitioners at every phase of the continuum will be actively engaged in, and make significant contributions to, TPC projects.

The portfolio of projects supported under TPC will address the broad goals listed above. Each individual project, however, should carefully focus on well-defined components of the teacher professional continuum. Proposed research efforts should clearly demonstrate promise to document what has been commonly held as, or promises to be, effective practice at various levels of the teacher professional continuum, or to develop research-based, professional development materials that align with national and state standards in science, mathematics, and technology in order to provide resources needed to support the teacher professional continuum. Each project must focus on science, technology, engineering and/or mathematics education and identify specific issues and target audiences. Special attention will be given to projects that address issues at critical transition points along the STEM professional continuum. Projects that target teacher preparation must address the role and design of STEM content courses, as well as content-focused methods courses. These projects must include STEM disciplinary and education faculty on project leadership teams. Each proposal must state the goal(s) of the project, identify the intended audience, and provide a rationale for the proposed work.

All projects will be expected to participate in an NSF-initiated third-party evaluation, which will require the submission of requested data to NSF program evaluators. This third-party evaluation will be separately funded by NSF.

The Project Summary must clearly identify the category under which the proposal is being submitted in order to ensure that the proposal is properly reviewed. Additionally, the project summary and project description of each proposal must explain how the proposed work addresses the two **National Science Board merit review criteria – intellectual merit (IM) and broader impacts (BI)**. These specific terms (IM & BI) must be explicitly used, indicating clearly that attention has been paid to these required elements. Proposals that do not address both merit review criteria in the Project Summary will be returned without review.

CATEGORIES OF PROJECTS

The TPC program supports (a) **research studies** on the recruitment, preparation, induction, enhancement, and retention of

teachers in the STEM disciplines; (b) development of research-based **resources for professional development** of STEM teachers; and (c) **workshops or symposia** that allow the STEM education community to share knowledge and ideas related to STEM educational research and/or STEM professional development.

A. Research Studies

Research studies should contribute to the knowledge base for the recruitment, preparation, development, and support of K-12 teachers of science, mathematics, engineering, and technology. Funded projects are expected to employ accepted research methods^[1] and to address issues of national importance. Research studies from small, focused projects through large-scale efforts are encouraged. All projects are expected, at a minimum, to inform the STEM education community of research methods and findings through publication in peer-reviewed journals, dissemination of results via presentations at scholarly meetings, submissions to digital libraries, and networking with others involved in STEM education research. The translation of research findings to practice is of paramount interest to the National Science Foundation. In addition to traditional modes of dissemination, innovative strategies that involve practitioner collaborations; disseminate research findings to STEM education practitioners and STEM disciplinary faculty; and/or promote implementation of effective strategies through targeting a broad range of audiences (e.g., policy makers, administrators, K-12 districts, higher education community, disciplinary professional societies) are required.

Research studies should investigate effective approaches to one or more of the following: (1) recruitment, pre-service preparation, and certification of teachers through traditional or alternative pathways; (2) implementation of strategies that focus on transition points along the teacher professional continuum; (3) development process for producing resources and support structures for K-12 STEM teachers; (4) strategies that address the changing needs of teachers as they advance through their professional career; (5) experiences that improve teacher performance across a variety of classroom settings and/or student populations; (6) development of models of pre-service instruction or in-service professional development that align with K-12 curriculum implementation and relevant classroom experiences; (7) studies of critical interactions among various components of models or systems and assessing their impact; (8) assessment of the sustainability of effective implementation efforts and their replication in other contexts; (9) development of high impact and innovative resources for the professional development of teachers, teacher leaders, teacher educators, and administrators. To the extent possible, projects should investigate connections between teacher development strategies and student learning. Active and meaningful collaboration and involvement of teachers is expected in all research studies.

The TPC program supports projects that research the development and dissemination of exemplary models, systems, or interventions that prepare, support, and sustain K-12 STEM teachers and/or promote quality STEM teaching. Projects may study existing exemplary STEM education models, systems, or interventions, or develop and test new ones. The project should clearly articulate essential components of the model or system, and their interactions. The proposal must describe how the research will study these components and the ways that their relationships influence the effectiveness of the model or system.

Where appropriate, proposals may include a request to fund a pilot-scale project of a new or modified professional development model, or intervention that is essential to the research study. In such broad projects, attention should be paid to the timing of initiation of the pilot and subsequent research phase of the project so as to ensure that the duration of the project gives adequate time to complete the research phase.

The Research Studies Category supports two levels of projects that should address critical issues of national interest: **Exploratory Projects** that are limited in scope and innovative in design, and **Research Projects** that use well-designed research methods to further the knowledge base about the recruitment, preparation (both undergraduate programs, as well as STEM professionals entering teaching as a second career), induction, enhancement, and/or retention of STEM teachers.

1. **Exploratory Projects** should be narrowly focused and are intended to encourage new researchers. It is therefore expected that the Principal Investigators (PIs) would invest a major time commitment to the effort. Highly innovative exploratory projects are encouraged. Examples of areas of interest are projects that would examine novel research protocols; develop, adapt, and test research instruments that may ultimately be broadly applicable to the research and evaluation of teacher professional continuum programming; synthesize research and disseminate findings that inform infrastructure development and practice; or conduct secondary data analyses or qualitative studies that

document the effectiveness of commonly recognized best practices. This category of project can also be used by first-time NSF PIs to create collaborations among researchers/practitioners, higher education and K-12 districts, etc. with the objective of developing a full Research Project proposal for submission to a subsequent competition. Any subsequent full proposal would fully document outcomes of the exploratory effort. Exploratory Projects can request up to \$100,000 per year, for maximum project duration of three years. The amount of the award will depend on the scope and complexity of the proposed effort. Exploratory projects of limited scope and budget are encouraged.

2. **Research Projects** are expected to contribute significantly to the knowledge base informing issues of national concern. Of special interest is research around pilot-scale models of STEM teacher professional continuum strategies that show promise for scalability. Projects of all sizes are encouraged within this level, but should not exceed a maximum annual average of \$500,000, for maximum project duration of five years.

Competitive proposals for both **Exploratory Projects** and **Research Projects** should contain the following elements in the Project Description section of the proposal. The extent to which these elements are effectively incorporated and integrated in the overall project plan will be the basis of merit review, in addition to the Foundation-wide criteria described in Section VI of this solicitation. Proposals must address all of the elements below, but they need not be in the order listed or explicitly titled.

Goals. State the goals of the proposed research and their alignment with TPC program goals. The proposal should clearly identify the project category, national need being addressed, and project focus (e.g., discipline, grade band, point(s) on the professional development continuum).

Rationale and Related Literature. Reference should be made to relevant theoretical and empirical research supporting the rationale for selecting the proposed area of study. The theoretical framework and grounding research for the proposed project should be described. The proposed study should build upon and relate to previous and on-going developments in educational theory and practice. The rationale for the project should describe its innovative aspects and the potential value added of the findings to the knowledge base informing the STEM education community, as well as the anticipated impact for STEM classrooms.

Research Questions and/or Hypotheses. Describe the research questions/hypotheses that will drive the inquiry of the proposed work and their relationship to national needs in STEM education. Proposals should also explicitly describe the relevance of research findings to STEM education, particularly the relevance of the results to practice. Innovative research questions that are centered in, and informed by, practice are encouraged.

Research Design. Describe all activities necessary to implement the research design. This section should include (1) methods for measuring the effects of the intervention; (2) plans for data collection, analysis, and interpretation; (3) sample design and relevant control groups when appropriate; (4) instruments and their validity and reliability; and (5) criteria by which success of the work will be measured. Proposals should identify the methods by which the researcher(s) will create a coherent chain of reasoning from formulation of the question or hypothesis, through data collection, analysis, and interpretation to conclusions.

Work Plan. Present a detailed timeline indicating when instruments will be developed (if appropriate), as well as when data will be collected and analyzed. The plan should also note important milestones that will inform progress being made, including dissemination of findings to the public. A complete description of who is responsible for each phase of the work is required.

Projects piloting a new or modified model or intervention should also provide details in the work plan and timeline for the implementation of activities, including who is responsible for what and when, and the connection between these activities and the subsequent research, data collection, and analysis.

Dissemination. Provide details of a comprehensive and robust dissemination plan for the research findings. Innovative strategies should focus on major stakeholders (practitioners, policy makers, administrators (K-12 and/or higher education), professionals in the STEM and education disciplines, and

members of the education research community. Particular attention should be placed on efforts that accelerate the translation of research to practice. All projects are expected to publish research findings in peer-reviewed journals. In addition, dissemination of the research findings via presentations at scholarly meetings, submissions to the National Science Digital Library (NSDL <http://www.nsdsl.org>) and networking with others involved in STEM education and research are expected.

Personnel. Describe the expertise represented by the project team, depicting the strength and balance of collaborations among STEM research and education faculty, education researchers, classroom teachers, administrators, as well as assessment and evaluation experts. The expertise, role, and commitment of the key project personnel should be described. Project leadership should include personnel who can provide a range of expertise to ensure multiple perspectives within the research project. Projects involving higher education institutions in delivery of STEM content or pedagogy must include STEM disciplinary faculty and education faculty on the leadership team.

Results of Prior NSF Support. If any key personnel have received funding from NSF during the past five years, information must be provided regarding the prior award(s) if relevant to the proposed scope of work (see *Grant Proposal Guide*, [NSF 04-2](#)). Evidence and data-informed results from previous support, including a discussion of lessons learned from both successes and failures must be provided. The proposal should describe how the proposed work differs from, and where appropriate, builds upon prior efforts.

B. Resources for Professional Development

Resources for Professional Development projects contribute to the preparation, support, enhancement, and sustaining of K-12 STEM teachers, leaders, teacher educators, and administrators. Resources for Professional Development must be grounded in research on teaching and learning, address a recognized national need, and advance the knowledge base on STEM teaching and/or the STEM teaching profession. Resources for Professional Development may include, but are not limited to, professional development materials focused on STEM content and pedagogy, tools (e.g., delivery systems, knowledge assessment instruments, applications of learning technologies), teacher education curricula, and information resources.

To strengthen the nation's capacity in providing high-quality STEM education, NSF invests significantly in the development of innovative, standards-based instructional materials and student assessments that are designed to create classroom environments enabling all students to achieve their full potential. Professional development demands of these materials are significant and their implementation (critical for testing their impact on students) requires strategies for significantly increasing the content knowledge and instructional skills of teachers. The TPC program encourages development of professional resources tied to specific sets of curriculum materials and/or to their classroom implementation.

Rapid advances in science are being made at the interface of traditional disciplines. Meeting these new challenges requires new, age-appropriate approaches to content knowledge development and pedagogical techniques, as well as innovative approaches that help teachers take advantage of appropriate educational technologies. Resources for Professional Development projects that address instructional needs for emerging areas of STEM education are also strongly encouraged.

NOTE: Potential PIs should be aware that TPC supports resources for STEM teacher professional development providers, including teacher preparation educators. Investigators wishing to submit proposals for the development of instructional materials for K-12 students should refer to the Instructional Materials Development (IMD) solicitation (www.ehr.nsf.gov/esie).

The TPC program supports two levels of projects, ***Proof-of-Concept Projects*** and ***Full Development Projects***.

1. ***Proof-of-Concept Projects*** are intended to develop and test prototype materials or tools. These projects should be focused on pilot-scale efforts and are intended to encourage and develop new investigators while fostering innovation. Projects developing effective Proof-of-Concept resources should consider submission of a proposal for full-scale development, field-testing, and dissemination to a subsequent TPC competition. Any subsequent full

proposal submission should fully document outcomes of the exploratory effort. Proof-of-Concept projects can request a maximum of \$150,000, for a duration not to exceed two years.

2. **Full Development Projects** are expected to create new resources, to demonstrate their effectiveness, and to promote the dissemination of tested and effective materials at a national level. The work should include a practical determination of the investment (time and money) needed for implementation. *Full Development Projects* can request a maximum of \$300,000 per year, for a duration not to exceed five years.

Potential PIs are expected to review existing materials related to the professional development of STEM teachers by consulting appropriate sources, such as the Teacher Education Materials (TE-MAT) database (<http://www.te-mat.org>) and the National Science Digital Library (NSDL) (<http://www.nsdsl.org>). Proposals should not duplicate materials that have already been developed, but should develop new materials and/or make revisions that significantly improve the quality of existing materials. In the latter case, the justification for revision must be compelling.

Resources for Professional Development proposals will be subject to merit review with emphasis placed on the extent to which required elements are effectively incorporated and integrated in the overall project plan, in addition to Foundation-wide criteria described in Section VI of this solicitation. Proposals must address all of the elements below, but they need not be in the order listed or explicitly titled.

Goals and Outcomes. Describe, in detail, the goals and the anticipated products of the project. Projects must identify learning goals for the targeted audience and what will constitute evidence that these goals have been met. The alignment of the proposed resources with research on teaching and learning and with standards-based content, instructional strategies, and assessment must also be presented.

Rationale. Present the rationale and supporting research for the intended resource. Proposed resources should (1) address a national need in the STEM teaching field; (2) be developed from a research base that grounds the work; (3) build upon and relate to previous and on-going developments in educational theory and practice; (4) support learning experiences and/or enhance the STEM teaching profession; and (5) promote improved teaching and learning in STEM classrooms. The proposal should clearly articulate the innovative aspects of the resources and the contribution that would be made to STEM education reform.

Anticipated Products. Describe in detail the format and content of the proposed resources (e.g., curricula, software, online courses, videos, CD-ROMs, tools, ideas, information resources).

Design and Work Plan. Describe the design plan, which should clearly explain how project goals will be achieved; what evidence will be collected; and what criteria will be used to evaluate the evidence. The proposal should explain how resources are to be created, reviewed, pilot- and field-tested, and revised. Describe the target audience for the resources and number and characteristics of participants who will be involved in all pilot- or field-testing. STEM educators similar to the target audience must be included in the development, review, and field-testing stages. Diverse populations should be engaged in field tests. The proposal must describe a plan for using pilot- and field-test results to inform revision of resources.

Proposals should address how resources may be adapted to serve audiences of varied needs and skill levels. A detailed work plan indicating who is responsible for each facet of the work and a timeline showing when each stage will be accomplished must be included.

Project Evaluation. Describe how the evaluation plan addresses the process of developing the resources and assessing their effectiveness. The evaluation must examine (1) the quality of the resources' content and pedagogy; (2) impact of the resources on the intended audiences for the intended purposes; (3) integrity of the development process; (4) integrity of the implementation process; and (5) cost effectiveness of developing and implementing the resources. The data collection instruments and the procedures for data collection, analysis and reporting, and all pilot-or field-testing must be described. The evaluation must document how findings from the formative evaluation, pilot- and field-tests informed the development/

revision process.

In addition, the evaluation plan must include an external review of materials to ensure accuracy of the content, appropriateness of the pedagogy, and other key features of the resources for the intended audience. External evaluators who are not themselves involved in the development process must conduct the review of the resources. Results of the summative evaluation and the external review of the resources must be reported directly to the National Science Foundation.

For *Proof-of-Concept* projects, the evaluation plan must be appropriate in scope to the scale of the project. This plan should include an external review of the proof-of-concept resource to ensure accuracy of content and appropriateness of pedagogy that will be part of any subsequent proposal seeking further support.

Dissemination. Provide a comprehensive and robust dissemination plan. This plan must include a strategy for publication and/or broad distribution, as well as a plan for educating appropriate audiences on the effective use of the resources. A timeline for securing a publisher (if appropriate) and/or identifying other dissemination outlets is expected. Proposals should address how the resources will be made available to relevant audiences including state/district/local administrators, practitioners, professional developers, higher education faculty in STEM and education disciplines, and experts in evaluation and assessment. It is expected that materials will be submitted to the National Science Digital Library (NSDL) and the Teacher Education Materials (TE-MAT) database. Projects must describe how they will disseminate information about the resource development process and the impact of the materials so as to promote their implementation.

Personnel. Describe the strengths and balance of appropriate collaborations among STEM disciplinary and education faculty, classroom teachers, school/district/state administrators, educational researchers, curriculum developers, as well as assessment and evaluation experts within the project team. The expertise, role, and commitment level of the key personnel should be described. Project leadership should include personnel who can provide a range of expertise, offer multiple perspectives, and assure diversity within the research project. Projects that involve STEM content must include both STEM disciplinary and education faculty on the leadership team.

Results of Prior NSF Support. Provide information regarding prior award(s) as relevant to proposed work, if any key personnel have received funding from NSF during the past five years (see *Grant Proposal Guide [NSF 04-2]*). Evidence and data informed results from previous support, including a discussion of lessons learned from both successes and failures must be provided. The proposal should describe how the proposed resources differ from, and where appropriate, build upon prior efforts.

C. Conferences and Symposia

Conferences and symposia are intended to assemble experts (1) to introduce, discuss, and/or synthesize research related to the recruitment, preparation, development or retention of K-12 STEM teachers; (2) to present and discuss professional resources for K-12 STEM teachers; or (3) to review and develop action plans for future research and resource development projects.

A maximum of \$200,000 may be requested for a conference or symposium. The duration of a grant may not exceed two years. A preliminary proposal is not required, but prior discussion with a TPC Program Director is strongly encouraged. Proposals may be submitted at any time, but are expected at least one year in advance of the planned event.

Competitive proposals for conferences and symposia must contain the following elements in their project descriptions:

Goals and Outcomes. Describe the major goals and anticipated outcomes of the conference or symposium. Tangible deliverables (if any) must be described.

Description of Event. Describe the content, format, purpose, intended audience, presenters, method of announcement or invitation, location, and dates for the proposed activity. Proposals should explain how

diverse groups, particularly those traditionally underrepresented in STEM education, would be enlisted as presenters and participants.

Rationale. Provide references to the literature or other evidence in support of the rationale for the proposed event. The proposal must explain how the event (1) addresses a national need, problem or issue; (2) builds on and relates to previous and on-going efforts in the field; (3) selects and/or recruits participants; and (4) advances knowledge among practitioners and others in the STEM content and education communities.

Work Plan. Provide a detailed work plan (including timeline of critical milestones) that identifies specific steps in planning and presenting the event, indicating who is responsible for each step.

Evaluation. Describe plans for the evaluation of the conference/symposium. Evaluation results must be reported to NSF.

Dissemination. Describe the plan for preparing and disseminating proceedings. Audiences should include STEM teachers, administrators, researchers, and others in the STEM research and education communities.

Personnel. Describe the planning team. This team should include strong and well-balanced collaborations among STEM research and education faculty, classroom teachers, school administrators, educational researchers, curriculum developers, and assessment and evaluation experts. The expertise, role, and commitment level of key personnel should be described. Teams are expected to include personnel who can provide a range of expertise, offer multiple perspectives, and assure diversity within the effort.

References

- Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (1999). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.
- Darling-Hammond, L. (2000). *Solving the dilemmas of teacher supply, demand, and quality*. New York: National Commission on Teaching and America's Future.
- Elmore, R. (1997). *Investing in teacher learning: Staff development and instructional improvement in Community School District #2, New York City*. New York: National Commission on Teaching and America's Future.
- Garet, M.S., Porter, A.C., Desimone, L., Birman, B.F., & Yoon, K.S. (2001). What makes professional development effective: Results from a national sample of teachers. *American Educational Research Journal* 38(4): 915-945.
- Goodlad, J. (1990). *Teachers for our nation's schools*. San Francisco, CA: Jossey-Bass.
- Hinds, M. (2002). *Teaching as a clinical profession: A new challenge for education*. New York: Carnegie Corporation of New York.
- Ingersoll, R. (2001). Teacher turnover and teacher shortages. *American Educational Research Journal* 38 (3): 499-534.
- National Commission on Teaching and America's Future. (2002). *Unraveling the "Teacher Shortage" problem: Teacher retention is the key*. Washington, DC: author.
- National Research Council. (2000). *Educating teachers of science, mathematics and technology: New practices for the new millennium (Committee on Science and Mathematics Teacher Preparation)*. Washington, DC: National Academy Press.
- Rand Mathematics Study Panel (2002). *Mathematical Proficiency for all Students: Towards a Strategic Development Program in Mathematics Education*, Rand Corporation MR-1643.0-OERI

Richardson, V. (Ed.) (2001). Handbook of research on teaching. (American Educational Research Association (Chapters 10-18).

Shavelson, J. & Towne, L., (Eds.) (2002). Scientific research in education. Washington, D.C.: National Academy Press.

Wilson, S. M., Floden, R. E., & Ferrini-Mundy, J. (2001). Teacher preparation research: Current knowledge, gaps, and recommendations. Seattle, WA: Center for the Study of Teaching and Policy

[1] For example, see: “Scientific Research in Education”, J. Shavelson and L. Towne, Editors, National Academy Press, 2002, or “Handbook of Research on Teaching”, V. Richardson, Editor, American Educational Research Association (Chapters 10-18), 2001.

III. ELIGIBILITY INFORMATION

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

Proposals may be submitted by institutions and organizations including universities, two- and four-year colleges, state and local education agencies, school districts, professional societies, research laboratories, informal science education centers, private foundations, or other public and private organizations whether for-profit or not-for-profit.

IV. AWARD INFORMATION

The program anticipates funding 25 to 35 awards in FY 2005. Total anticipated funding for FY 2005 is \$28,000,000, pending availability of funds. The following table gives the maximum award amounts for the respective TPC categories:

Category	Award Maximum	Duration
A. Research Studies		
Exploratory	\$100,000 per year	1-3 years
Research Projects	\$500,000 per year	2-5 years
B. Resources for Professional Development		
Proof-of-Concept	\$150,000 total	1-2 years
Full Development	\$300,000 per year	2-5 years
C. Conferences and Symposia	\$200,000 total	1-2 years

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals (*required*):

Description:

Projects falling within Categories A or B require a preliminary proposal as a prerequisite for the full proposal submission. Preliminary proposals must be submitted via FastLane no later than 5:00 p.m., local time, on the specified deadline. Preliminary proposals are not required for Category C.

Submission of preliminary proposals via FastLane requires completion of the following FastLane forms:

Cover Sheet. Complete this form with the appropriate information and make sure to check the preliminary proposal box.

Project Summary. Provide a one-page summary that includes a heading and the project abstract. The heading should include the title of the proposed endeavor, the names of the submitting institution and Principal Investigator, and the project category. The abstract should briefly describe the project goals, content, and duration. It must also include a description of the project participants including discipline(s) and grade level(s). **Note:** The abstract must address both National Science Board merit review criteria, *Intellectual Merit* and *Broader Impacts*. Effective October 2002, NSF will return, *without review*, proposals that do not address both merit review criteria in separate statements. The abstract should not exceed 250 words.

Project Description. Identify the TPC program category for which the proposal is to be considered, and describe the following project elements: (a) rationale and related research, (b) goals and projected outcomes, (c) work plan for accomplishing the goals, (d) personnel, (e) essential features and characteristics, (f) evaluation plans (if applicable), and (g) dissemination plans. Limited to six pages with 2.5-cm margins on all sides, the project description should be single-spaced and use a legible, 12-point font.

Budgets. Provide an estimated budget for the total amount of money requested from NSF, with information on salaries and other expenses, including but not limited to, equipment (where allowable), participants, consultants, travel, subawards, and indirect costs. Include a budget narrative that describes and justifies each of the expenses.

Preliminary proposals require cumulative budgets only. Given FastLane's present constraints, the only option available is to enter the project's cumulative budget as the Year 1 budget. FastLane automatically creates the cumulative budget, which, in the case of preliminary proposals, is identical to the Year 1 budget. Enter a one-page budget-explanation narrative in the Budget Justification section.

Biographical Sketches. Provide a brief narrative describing the key personnel expertise, relevant to the proposed work. Biographical sketches should be sufficiently detailed to show that the necessary expertise is available to conduct the project.

Supplementary Documents. Appendices and letters of support are NOT permitted for preliminary proposals.

Review of Preliminary Proposals

Carefully selected reviewers from the field and members of the NSF staff will review preliminary proposals. Ultimate submission of a formal proposal is either encouraged or discouraged based on the reviewers' perceptions of the likelihood that a proposal, as written, will be successful in the formal merit-review process. ***This recommendation is strictly an advisory opinion; formal proposals may be submitted regardless of the recommendation.*** Written reviews are intended to provide constructive feedback and suggestions that will help strengthen the final proposal. Reviews are returned

as expeditiously as possible, but no later than one month prior to the full-proposal submission date.

Full Proposal Instructions:

Proposals submitted in response to this program announcement/solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF *Grant Proposal Guide* (GPG). The complete text of the GPG is available electronically on the NSF Website at: <http://www.nsf.gov/cgi-bin/getpub?gpg>. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

The following instructions deviate from the GPG guidelines:

Description:

Proposals for projects falling within Categories A or B must be submitted via FastLane no later than 5:00 p.m., local time, on the specified deadline. Proposals for Category C are accepted at any time, but are expected to be submitted at least one year prior to the date of the planned event. Submission of full proposals via FastLane requires completion of the following FastLane forms:

Cover Sheet. Complete this form with the appropriate information. Make sure to enter both the program announcement/solicitation number and related preliminary-proposal number. Failure to submit this information may delay proposal processing.

Project Summary. Provide a one-page summary that includes a heading and the project abstract. The heading should include the title of the proposed endeavor, the names of the submitting institution and Principal Investigator, and the project category. The abstract should briefly describe the project goals, content, and duration. It must also include a description of the targeted audience including discipline(s) and grade level(s). **Note:** The abstract must address both National Science Board merit review criteria, *Intellectual Merit* and *Broader Impacts*. Effective October 2002, NSF will return, *without review*, proposals that do not address both merit review criteria in separate statements. The abstract should not exceed 250 words.

Project Description. Refer to the *Program Description* section of this solicitation, which clearly outlines the requirements for the project description section (of the proposal) for each specific TPC category. Limited to 15 pages with 2.5-cm margins on all sides, the project description narrative should be single-spaced and use a legible, 12-point font.

References. List all literature cited in the project description narrative.

Biographical Sketches. Include a biographical sketch for each member of the key personnel. Limited to two pages, each sketch should be sufficiently detailed to show that the necessary expertise is available to conduct the project.

Budget. Provide a budget request for each year of the project. If applicable, also include a complete budget for each year of individual subawards. FastLane automatically creates the cumulative project budget. Limited to three pages, the accompanying budget justification should clearly explain how each line-item was determined.

Current and Pending Support. Enter requested information on all current, pending, and future support (including non-NSF sources) for each member of the key personnel. The proposed project, and all other projects, requiring a portion of the personnel time should be included, even if no salary support is provided. This information is necessary to ensure that every member of the leadership team has sufficient time to carry out the project, and that there is no duplication of support.

Facilities, Equipment & Other Resources. Complete the applicable information requested.

Special Information/Supplementary Documentation. If applicable, provide additional documents such as letters indicating support for the proposed project. Please note that reviewers are not required to read the supporting documents. Therefore, make certain that the project description provides sufficient information about the project that will enable reviewers

to make informed judgements.

Proposers are reminded to identify the program announcement/solicitation number (04-568) in the program announcement/solicitation block on the proposal Cover Sheet. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost Sharing:

Cost sharing is not required in proposals submitted under this Program Solicitation.

Indirect Cost (F&A) Limitations:

Indirect costs are not allowed on participant support costs.

Other Budgetary Limitations:

Funding Levels -- Budgets should reflect the scope and impact of the proposed work. The level of funding is determined by the size and nature of the activity. All projects must be cost-effective and budgets must adequately justify requested funds.

Projects involving *Research Studies* (Category A) may not exceed \$100,000 per year for a duration of up to 3 years for Exploratory Projects and \$500,000 per year for a duration of up to 5 years for Research Projects. Projects involving the *Resources for Professional Development* (Category B) may not exceed a total budget of \$150,000 for Proof-of Concept projects and \$300,000 per year for a duration of up to 5 years for Full Development projects. *Conferences and Symposia* (Category C) may not exceed a total budget of \$200,000 for a duration of up to 2 years.

Budget Preparation Instructions:

Equipment purchases that support the efforts of the research and development process or the development of professional resources are allowed, but must be justified in the *Project Description* and *Budget Justification* of the full proposal.

The budget narrative should reflect the work plan and justify any request for tuition. If there is a budget request for instructional salary support and indirect costs are claimed, tuition costs are not allowed.

A direct stipend of up to \$100 per day (prorated for partial days) for participation in project activities occurring outside of paid school time is allowed. The total stipend may exceed that amount if it is supplemented from other sources. Stipends/honoraria for conference or symposia attendance are not allowed.

The use of NSF funds to hire substitute teachers is allowed under the following conditions: (1) it is necessary to meet the goals and objectives of the project, and (2) it can be documented that the substitute teachers are directly replacing teachers participating in the NSF-funded project. Substitute teachers should be paid in accordance with established school-district policies, and in lieu of paying the teachers participating in the project. Records must be maintained on the hiring and use of substitutes.

Requests for publication costs for conference and symposia proceedings are allowed.

C. Due Dates

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

Preliminary Proposals (required):

May 25, 2004

Required for categories (A) Research Studies and (B) Resources for Professional Development; not required for category (C) Conferences and Symposia

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

September 10, 2004

Deadline applies to Categories A and B. Proposals for category C may be submitted at any time, but are expected to be submitted at least one year in advance of the planned event.

D. FastLane Requirements

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

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the [Grant Proposal Guide](#) for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Proposers are no longer required to provide a paper copy of the signed Proposal Cover Sheet to NSF. Further instructions regarding this process are available on the FastLane Website at: <http://www.fastlane.nsf.gov>

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

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

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

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

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

The two National Science Board approved merit review criteria are listed below (see the [Grant Proposal Guide](#) Chapter III.A for further information). The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which he/she is qualified to make judgments.

What is the intellectual merit of the proposed activity?

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

What are the broader impacts of the proposed activity?

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

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

Integration of Research and Education

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

Integrating Diversity into NSF Programs, Projects, and Activities

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

Additional Review Criteria:

In addition to the Foundation-wide criteria described above, special criteria to be used in evaluating Research Studies, Resources for Professional Development, and Conference and Symposia proposals are described under the Project Description (Section II of this solicitation) for each category.

Additional review criteria for Research Studies include the goals of the proposed research and their alignment with the TPC program goals; the rationale and related literature relevant to the proposed project; the research questions associated with the proposed work; the research design; the work plan; dissemination plans; project personnel; and results of prior NSF support.

Additional review criteria for Resources for Professional Development include goals and outcomes of the project; rationale for the proposed resources; anticipated products; design and work plan; project evaluation; dissemination; personnel; and results of prior NSF support.

Additional review criteria for Conferences and Symposia include goals and outcomes; description of the event; rationale; work plan; evaluation; dissemination; and personnel.

B. Review Protocol and Associated Customer Service Standard

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

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

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

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

NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the date of receipt. The interval ends when the Division Director accepts the Program Officer's recommendation.

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (NSF-GC-1); * or Federal Demonstration Partnership (FDP) Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards also are administered in accordance with NSF Cooperative Agreement Terms and Conditions (CA-1). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

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

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

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.

Additional reporting requirements apply, as described in Section II of this solicitation. Specifically, all projects will be expected to participate in an NSF-initiated third-party evaluation, which will require the submission of requested data to NSF program evaluators. This third party evaluation will be separately funded by NSF.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for the PI and all Co-PIs. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project reporting system, available through FastLane, for preparation and submission of annual and final project reports. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding this program should be made to:

- Wayne W. Sukow, Section Head (Acting), Teacher Professional Continuum, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5122, fax: (703) 292-9044, email: wsukow@nsf.gov
- David B. Campbell, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5093, fax: (703) 292-9044, email: dcampbel@nsf.gov
- Julia V. Clark, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5119, fax: (703) 292-9044, email: jclark@nsf.gov
- Patricia K. Freitag, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-7322, fax: (703) 292-9044, email: pfreitag@nsf.gov
- Michael R. Haney, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5102, fax: (703) 292-9044, email: mhaney@nsf.gov
- Daniel L. Householder, Program Director, Directorate for Education & Human Resources, Division of Elementary,

Secondary, & Informal Education, 885 S, telephone: (703) 292-5112, fax: (703) 292-9044, email: dhouseho@nsf.gov

- Karen King, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5105, fax: (703) 292-9044, email: kking@nsf.gov
- Monica Mitchell, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5110, fax: (703) 292-9044, email: mmitchel@nsf.gov
- Monica Neagoy, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-4688, fax: (703) 292-9044, email: mneagoy@nsf.gov
- Carole Stearns, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5108, email: cstearns@nsf.gov
- Umesh Thakkar, Lead Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5094, email: uthakkar@nsf.gov
- Emmett L. Wright, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885.45 S, telephone: (703) 292-5088, fax: (703) 292-9044, email: elwright@nsf.gov
- Joan T. Prival, Lead Program Director, Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4635, fax: (703) 292-9015, email: jprival@nsf.gov
- Katherine Denniston, Program Director, Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4620, email: kdennist@nsf.gov
- John Dwyer, Program Director, Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4653, fax: (703) 292-9015, email: jdwyer@nsf.gov
- Theodore W. Hodapp, Program Director, Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4640, email: thodapp@nsf.gov
- Krishna Vedula, Program Director, Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4641, fax: (703) 292-9015, email: kvedula@nsf.gov
- Lee L. Zia, Program Director, Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-5140, fax: (703) 292-9046, email: lzia@nsf.gov
- General TPC Information, telephone: (703) 292-8613,

For questions related to the use of FastLane, contact:

- ESIE FastLane Contact, telephone: (703) 292-8620, email: ehr-esie-info@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.

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