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ELEMENTARY, SECONDARY, AND INFORMAL EDUCATION

Program Announcement and Guidelines

Informal Science Education

Instructional Materials Development

Teacher Enhancement

Advanced Technological Education

Presidential Awards for Excellence in Mathematics and Science Teaching
[by nomination only]

NATIONAL SCIENCE FOUNDATION
Directorate for Education and Human Resources

INQUIRIES

Inquiries regarding NSF activities for pre-kindergarten through grade 12 education that are not addressed in this publication may be directed to:

Division of Elementary, Secondary, and Informal Education (ESIE)
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Requests for limited numbers of copies of **ESIE publications**, the NSF ***Grant Proposal Guide* (NSF 95-27)**, and the NSF ***Guide to Programs*** can be obtained directly through the following means: (1) **Telephone:** (703) 306-1128 or **Electronic Mail:** esiepubs@nsf.gov (identify the publication by title/number and provide your name, complete address, and telephone number) or (2) **World Wide Web:** http://www.nsf.gov.

PROGRAM AREA	TELEPHONE NO.
Informal Science Education (ISE) **Parent Involvement in SMT Education**	(703) 306-1616
Instructional Materials Development (IMD) **Advanced Technological Education (ATE)**	(703) 306-1614
Teacher Enhancement (TE) (includes Teacher and Student Development)	(703) 306-1613
Presidential Awards for Excellence in Science and Mathematics Teaching (PAESMT)	(703) 306-0422

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INTRODUCTION

EDUCATION MISSION OF THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) has a mandate to ensure the vitality of science and technology in the United States. Recognizing the important link between research and education in these fields, the NSF enabling legislation explicitly gives it responsibility for the quality and effectiveness of the Nation's underlying human resource base. Stimulating quality education in science, mathematics, engineering, and technology is vitally important to ensure economic success in a global economy that is characterized by increasing technological sophistication. The Foundation has a cohesive and comprehensive set of education and human resources activities addressing every level of education, including early career development.

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES

Programs within the Directorate for Education and Human Resources (EHR) promote student, teacher, and faculty development, as well as improved public science literacy through the support of projects which operate on national, regional, and local levels. The Directorate's five major long-term goals center on the delivery of quality science, mathematics, and technology (SMT) education for ***all*** students. These goals are to ensure that—

- high-quality SMT education is available to every child in the United States, enabling all who have interest and talent to pursue scientific and technical careers at any level and supporting scientific literacy of all citizens;
- educational pipelines carrying students to careers in science, mathematics, engineering, and technology yield sufficient numbers of individuals to meet the demands of the technical workplace;
- those who select careers in science or engineering disciplines have high-quality educational opportunities available to them;
- interested non-specialists have opportunities to broaden their scientific and technical knowledge; and,
- the larger public has opportunities to develop an understanding of scientific and technological developments and processes.

While all NSF research Directorates support SMT education activities, EHR assumes primary responsibility for the Foundation's education mission, especially in elementary, secondary, and lower-division undergraduate levels, as well as public science literacy. The above-mentioned goals provide the focus for the activities of EHR organizational units:

Division of Elementary, Secondary, and Informal Education (ESIE) . . .(703) 306-1620

Division of Undergraduate Education (DUE) . . . . . .(703) 306-1670

Division of Graduate Education (DGE) . . . . . .(703) 306-1630

Division of Educational System Reform (ESR) . . . . . .(703) 306-1690

Division of Human Resource Development (HRD) . . . . . .(703) 306-1640

Division of Research, Evaluation, and Communications (REC) . . . . .(703) 306-1650

Office of Experimental Program to Stimulate Competitive Research (EPSCoR) . . . . . .(703) 306-1683

This program announcement covers all programs within the Division of Elementary, Secondary, and Informal Education (ESIE) and replaces the previous *Program Announcement and Guidelines* (NSF 95-150). Brief supplements may be issued to announce relevant changes or additions, and special solicitations may be issued for new, developing initiatives. With the exception of the Division of Graduate Education and the Office of EPSCoR, each organizational unit in EHR supports preK-12 projects. Refer to the NSF ***Guide to Programs: Fiscal Year 1996*** (NSF 95-138) and the program announcements of other EHR organizational units for further information.

DIVISION OF ELEMENTARY, SECONDARY, AND INFORMAL EDUCATION

Goals. Programs of the Division of Elementary, Secondary, and Informal Education (ESIE) support projects that enable ***all*** students—pre-Kindergarten through grade 12 (preK-12)—to succeed in science, mathematics, and technology (SMT) and to increase the scientific and technological literacy of students and adults of all ages. Its programs provide the educational foundation for future generations of scientists, engineers, and technologists; for those pursuing post-secondary education in other disciplines; and for those who enter the workforce directly from secondary school. ESIE programs promote the achievement, competency, and literacy essential to inform citizens about the SMT issues that impact their lives, as well as promote effective advocacy for high-quality education in these fields.

Objectives. To provide leadership and to promote development of the infrastructure and resources needed to improve SMT education throughout the United States, ESIE programs—

- Strengthen skills of the teacher workforce by
  - — expanding and deepening the understanding of content, pedagogy, and educational technologies;
  - — heightening awareness and deepening understanding of

the diverse experiences and needs of students;
  — grounding continued professional development in the context of the school structure and organization; and,
  — developing a cadre of teachers and administrators who can effectively lead reform in these fields.

- Develop alternative models of course and curriculum materials aligned with standards for content, teaching, and assessment that
  — enhance the knowledge, thinking skills, and problem-solving abilities of all students;
  — incorporate the recent advances in disciplinary content, research on teaching and learning, and educational technologies; and,
  — can be implemented broadly and in diverse settings.

- Promote transitions between secondary school and the workplace, as well as transitions within the workplace through the development of exemplary curricula, varied instructional environments, and other activities.

- Provide stimulating opportunities outside school that
  — increase participation in (and understanding of) SMT by individuals of all ages, interests, and backgrounds, informing them of its impact in their daily lives and aiding them in making responsible decisions about science policy issues;
  — establish linkages with formal education to improve education in all learning environments; and
  — stimulate parents and others to become informed proponents for quality and universally-available education in these fields and enable them to support their children's science and mathematics endeavors.

- Capitalize on educational technologies and electronic networking in the development of all materials and instructional strategies in a manner that ensures that quality education is accessible to all students.

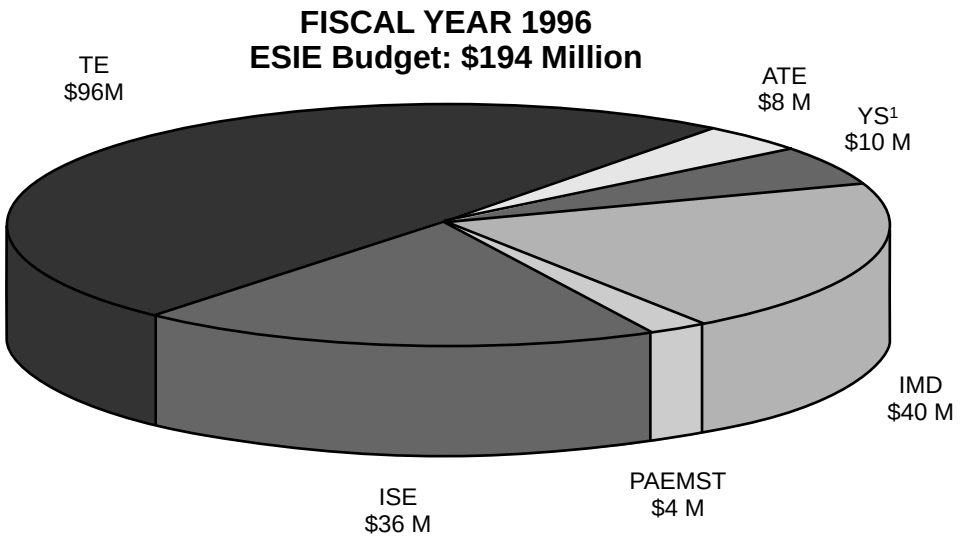
To achieve these objectives, ESIE supports the development of high-quality course and curriculum materials for all students through its **Instructional Materials Development (IMD) program;** strengthens teachers' content and pedagogical skills and creates an infrastructure of professional educators, educational researchers, and administrators to support SMT education reform through its **Teacher Enhancement (TE) program;** provides research experiences for students and their teachers under a special component of the TE program; creates a nationwide network of teacher leaders recognized for career achievement under the **Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST);** provides stimulating opportunities outside of school to promote appreciation, interest, and understanding of science, mathematics, and technology for youth and adults through its **Informal Science Education (ISE) program**; and strengthens the SMT preparation of students who will enter the advanced technological workforce through its **Advanced Technological Education (ATE)[1] program.**

[1]The ATE program is co-managed by the Division of Elementary, Secondary, and Informal Education and the Division of Undergraduate Education.

FY 1996 PROPOSAL SUBMISSION AND AWARD STATISTICS
(for programs receiving proposals for FY 1997 funding)

PROGRAM	*Full Proposals Received*	*No. of Awards*	*Funding Rate*	*Award Range (thousands)*	*Duration (years)*
Informal Science Education	130	44	.35	$ 25 - 3,000	1 - 5
Instructional Materials Development	116	42	.35	$ 10 - 2,794	1 - 4
Teacher Enhancement	362	92	.25	$ 19 - 5,999	1 - 5
Presidential Awards for Excellence in Mathematics and Science Teaching *	648	216	.33	$ 7.5	3
Advanced Technological Education	115	39	.34	$ 50 - 3,000	1-3

*Number of proposals includes only those pre-selected by States and territories for the national competition.



(1) The last two-year awards under the Young Scholars (YS) program were made in FY 1996; see TE program for funding opportunities for teacher and student research projects.

EXECUTIVE SUMMARY OF PROGRAMS

INSTRUCTIONAL MATERIALS DEVELOPMENT

Instructional Materials Development (IMD) projects create curricula, materials, and student assessments that change classroom instruction, enabling students to acquire a sophisticated understanding of content knowledge, higher-order thinking abilities, and problem-solving skills. These materials incorporate investigative, hands-on SMT education activities and align with recently developed standards for content, teaching, and assessment. IMD-supported materials promote the success of ***all*** students, regardless of background or ability, and promote positive student attitudes toward science, mathematics, and technology. Projects range from major revisions and implementation of existing materials to the creation of entirely new ones; from a few modules at a single instructional level to comprehensive curricula for several school years; from a focus on a single subject to the integration of several disciplines; and from assessments embedded in classroom materials to the creation of assessment items and full programs that can be used by districts and states. All projects include comprehensive national dissemination plans to ensure use of the materials in numerous and diverse settings. In cooperation with TE, IMD will support implementation sites to assist districts in the selection and classroom implementation of curricula; in cooperation with ISE and TE, IMD also will support projects to increase the involvement of parents and caregivers in SMT education (see special program sections of these *Guidelines*).

INFORMAL SCIENCE EDUCATION

Informal Science Education (ISE) activities provide rich and stimulating opportunities outside of formal school settings, where individuals of all ages, interests, and backgrounds increase their appreciation and understanding of science, mathematics, engineering, and technology. ISE projects take place in diverse environments (e.g., museums of all types, community centers, the home) and involve the use of various media (e.g., broadcast, film, interactive technology, print). Projects typically are designed to reach large audiences or to have the potential for significant national or regional impact. To broaden its impact, ISE promotes collaborations among organizations that have similar goals, especially when such projects bridge the informal and formal education communities. Through collaborations, partners combine their resources and expertise to develop effective strategies for reaching target audiences. In cooperation with IMD and TE, ISE will support projects to increase involvement of parents and care-givers in SMT education (see special program section of these *Guidelines*).

TEACHER ENHANCEMENT

Teacher Enhancement (TE) projects provide professional development opportunities to broaden and deepen the disciplinary and pedagogical knowledge of teachers, improving their ability to deliver rich and challenging SMT education to all students. Through active involvement of administrators, projects develop school cultures that provide requisite resources to implement classroom improvements and sustain professional development opportunities. TE supports projects that (1) develop teachers who become leaders in content and pedagogy; (2) engage teachers and students in meaningful research experiences that can be translated back to classrooms; (3) provide cost-effective replication of effective projects; (4) create professional development materials; and (5) provide innovative applications of educational technologies in networking underserved populations and giving them cost-effective access to quality SMT resources and in-service training. Emphasis is placed on projects that focus on the professional development of teachers as the primary drivers for implementing SMT education reform in entire school districts. In cooperation with IMD, TE will support implementation sites to assist districts in selecting and implementing NSF-supported curricula; in cooperation with ISE and IMD, TE also will support projects to increase involvement of parents and caregivers in SMT education (see special program section of the *Guidelines*).

PRESIDENTIAL AWARDS FOR EXCELLENCE IN MATHEMATICS AND SCIENCE TEACHING

The NSF operates The Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST) program on behalf of the White House. PAEMST rewards career excellence for teachers at both elementary and secondary grade levels. Awards are made in each state and four jurisdictions (i.e., Washington, DC, Puerto Rico, The Department of Defense Dependent Schools (DoDDS), and US Territories (American Samoa, Guam, The Commonwealth of the Northern Marianas, and the Virgin Islands) taken as a group. Teachers submit applications to state or jurisdiction selection committees which, in turn, select three candidates from each of the four disciplinary/grade-level award groups. These nominees are then forwarded to a national selection committee, comprised of prominent scientists, mathematicians, educators, and past awardees. The national committee recommends four finalists (one from each of the four disciplinary/grade-level categories) from each state and eligible jurisdiction. PAEMST teachers constitute a national network of outstanding leaders in science and mathematics education and are a rich resource for the improvement of science and mathematics education throughout the Nation.

ADVANCED TECHNOLOGICAL EDUCATION

Ensuring internationally competitive manufacturing, protection of the environment and effective development and use of new technologies requires technicians well-educated in science and engineering. This program promotes the exemplary education of technicians at the two-year college level and quality preparation

at the secondary level. Projects require partnerships of two-year colleges with four-year colleges and universities, secondary schools, business, industry, and government. The program supports instructional materials development, professional development for faculty and teachers, technical experiences for students and teachers and instrumentation and laboratory improvement. The ATE Program features a few national and regional centers that combine all these aspects, as well as projects that concentrate on one or more aspects. The program also accepts proposals for activities that lead to better understanding of issues surrounding advanced technological education. ATE is jointly managed by ESIE and the Division of Undergraduate Education (DUE).

AREAS OF SPECIAL INTEREST in ESIE

- *Local Systemic Change (LSC) projects to implement the reform of science and mathematics education through teacher enhancement at local levels. Current foci are on SMT education, grades K-8, and mathematics, grades 7-12.*
- *Special implementation sites to accomplish broad-scale dissemination and implementation of standards-based instructional materials in science and/or mathematics to school districts that have decided to implement NSF-supported comprehensive curricula.*
- *Projects that bring effective innovations to the delivery of SMT education through creative applications of educational technologies and* networking so as to ensure the delivery of quality SMT education; *formations of meaningful partnerships among major education stakeholders, e.g., the formal and informal science communities; and linkages between education and research communities*
- *Projects that meaningfully involve parents and adults as proponents of high-quality SMT education and as supporters of children's educational endeavors in these disciplines. Support is provided out of the ISE, IMD, and TE programs, as appropriate.*

GUIDELINES FOR PROPOSAL DEVELOPMENT

PRELIMINARY PROPOSAL REQUIREMENT

All programs in ESIE (except Presidential Awards for Excellence in Mathematics and Science Teaching) require submission of a preliminary proposal. Preliminary proposals give NSF staff the opportunity to comment on a proposal's responsiveness to program goals and priorities, as well as its likely ability to compete successfully with other proposals in the merit review process. The sections that follow describe program-specific and general submission requirements. Preliminary proposals must be postmarked before listed target dates in order for a full proposal to be eligible for submission to the next competition. PI's should submit preliminary proposals as early as possible to ensure adequate time to consider staff reviews.

PROPOSAL SUBMISSION

Requirements for proposal submission in response to these *Guidelines* are detailed in the section, *"Preparation and Submission of Proposals."* Unless otherwise specified in this publication, proposals should follow requirements set forth in the ***Grant Proposal Guide (GPG)* (NSF 95-27).** Single copies of the ***GPG*** are available at no cost from the Forms and Publications Unit, via electronic mail at pubs@nsf.gov, or via the World Wide Web at http:\\www.nsf.gov.

PROPOSAL SUBMISSION DATES

Program	*Preliminary Proposal*	*Full Proposal*
Informal Science Education	March 3 August 1	June 2 November 17
Parent Involvement in Science, Mathematics, and Technology Education	July 15	October 15
Instructional Materials Development	May 1	August 15
Teacher Enhancement	April 1	September 2
Implementation and Dissemination	April 1	August 15
Advanced Technological Education	April 29	October 21

ELIGIBILITY

A PI may submit only one full proposal to each program per closing date. Requests for exceptions must be made directly to the program. PI's may, however, submit multiple preliminary proposals to an individual program.

Eligible Fields and Disciplines. Proposals may be submitted for projects in any field of science, mathematics, engineering, and technology typically supported by NSF. Projects involving fundamental concepts within technical, professional, or pre-professional programs are eligible. Multi-disciplinary and interdisciplinary proposals are encouraged.

NSF does not support projects that address clinical fields such as medicine, nursing, clinical psychology, and physical education, as well as those that primarily involve social work, home economics, business, the arts, and the humanities. Innovative projects that link scientific and technical study with the humanities are permissible. For further information, please consult the ***GPG* (NSF 95-27)**.

Eligible Institutions and Departments. Organizations with a scientific or educational mission are eligible to submit proposals. These include: colleges and universities, state and local education agencies, school districts, professional societies, museums, research laboratories, media producers, private foundations, private industry, publishers, and other public and private organizations whether for profit or not-for-profit. Proposers are strongly encouraged to involve participation from other sectors. See program descriptions for specific requirements.

EDUCATIONAL TECHNOLOGIES

Educational technologies are rapidly advancing and show great promise for fostering learning and ensuring access to education opportunities. Proposals are encouraged that include or investigate their application in innovative ways to help achieve quality education in science, mathematics, engineering, and technology. Priority will be given to projects whose outcomes have long-range implications for future development and practice. Of particular interest are projects that deliver sound SMT education and incorporate educational technologies that —

- allow students to learn in ways that can not be achieved by other means;
- provide students opportunities for acquiring technology-based workplace skills;
- build on, or contribute to, current research on learning and information systems;
- achieve more effective and more pervasive results than otherwise possible;
- significantly broaden the impact and reduce the cost of change;
- provide the tools and training so teachers and institutions can investigate, reflect, and learn from their educational practice;
- support teachers and students in SMT inquiry through research activities, publication, access to resources, or other appropriate methods; and,
- disseminate results of successful projects, integrate the

work of multiple projects, promote partnerships, increase other stakeholders' participation in (and responsibility for) delivering education.

EVALUATION

Evaluation informs decision-makers at the agency level about issues of program accountability and effectiveness, as well as those at the project level about progress and the merit of particular strategies. Documentation of progress and impact is also a precondition for securing additional funding. Evaluation can be categorized into three types according to its purpose.

- ***Accountability***—provides a descriptive reporting that demonstrates program success and project effectiveness, including the numbers and level of participant involvement. As appropriate, it should provide evidence of the project's impact on teacher knowledge and behavior, school change, and/or student outcomes.
- ***Management***—provides project management information that can be used to strengthen a project. Such formative information could document delivery strategies, implementation methods, barriers to implementation, and achievement of milestones and objectives.
- ***Knowledge***—uses research and disciplined inquiry to add to the information base and benefits future projects and program design. Research findings may, for example, address the effectiveness of delivery methods; document the effectiveness of interventions and their subsequent implementation; or collect evidence that demonstrates knowledge acquisition, changes in attitudes and interests, and/or changes in behavior of participants.

Projects must have accountability and management evaluation components. Evaluations should (1) reflect continuous study and observation through data collection and synthesis; (2) document effective methodologies, accomplishments, and successes in achieving objectives; and, (3) have both formative and summative components, e.g., analysis and use of information both during and following the project. The evaluation effort should reflect project complexity, scale, and cost. Proposals should describe objectives and critical questions; key evaluation personnel; the process for collecting and analyzing information; intended use for monitoring the progress; and a time-line of major milestones. Most projects require assistance of external evaluators to provide objectivity and expertise.

DISSEMINATION

To achieve widespread and enduring impact, the outcomes of successful projects must be disseminated widely to SMT educators, scientific communities, or the general public. The value of a project, in large measure, depends on the quality and utility of what is learned or produced and on the breadth and effectiveness of related dissemination activities. Accordingly, plans for dissemination of project results are given significant weight in the review of proposals. Dissemination plans should identify target audience(s) and describe material to be disseminated, methods of dissemination (e.g., commercial publications, journal articles, electronic networks, conference presentations, audiovisual materials, media), available resources, mechanisms for replication, promotional strategies, and/or procedures for determining success, as appropriate. Multiple dissemination approaches are encouraged.

COORDINATION WITH NSF SYSTEMIC INITIATIVES

To the extent possible, the EHR Directorate seeks coordination of program activities in the field to ensure that projects reinforce and complement each other whenever possible. Of particular interest is coordination of projects with large-scale systemic reform efforts, i.e., Local Systemic Change (LSC) projects [TE program, ESIE]; Statewide Systemic Initiatives (SSI), Urban Systemic Initiatives (USI), Rural Systemic Initiatives (RSI) [Division of Educational System Reform (ESR)]; Collaboratives for Teacher Preparation (CETP) [Division of Undergraduate Education (DUE)], and Comprehensive Partnerships for Minority Student Achievement (CPSMA) [Division of Human Resource Development (HRD)]. Prior to proposal submission, prospective PI's must consult with PI's of relevant systemic projects if they intend to operate in the same geographic area. Proposals should ensure that this contact has been made and describe the character of anticipated interaction between the projects. If applicants feel that interaction with systemic projects is not appropriate, they must provide an explanation to that effect in their proposal.

INFORMAL SCIENCE EDUCATION PROGRAM

Target Dates for Proposals
Full—*June 2*; **Preliminary, No Later Than—***March 3*
Full—*November 17*; **Preliminary, No Later Than—***August 1*

Telephone: 703-306-1616

GOALS AND OBJECTIVES

Informal Science Education (ISE) supports projects in which learning is voluntary and self-directed, life-long, and motivated mainly by intrinsic interests, curiosity, exploration, manipulation, fantasy, task completion, and social interaction. Informal learning can be linear or non-linear and often is self-paced and visual- or object-oriented. It provides an experiential base and motivation for further activity and learning. The outcomes of an informal learning experience in science, mathematics, and technology include a better understanding of concepts, topics, processes, and thinking in scientific and technical disciplines, as well as increased knowledge about career opportunities in these fields.

In order to produce significant positive changes, the ISE program pursues the following goals:

- to increase the number of youth, particularly underrepresented (e.g., minorities, girls, the physically disabled) and underserved (e.g., rural communities), who are excited about SMT and who pursue such activities both in and out of school;
- to establish linkages which promote new relationships between informal and formal education resulting in improved and creative SMT education in all learning environments;
- to stimulate parents and other adults to become effective proponents for better quality and more universally available SMT education in both formal and informal settings and to encourage them in the support of their children's science and mathematics endeavors in the home and elsewhere;
- to bring informal science education programs and activities to relatively large areas currently without, or minimally reached by, such opportunities, e.g., rural areas and inner-city environments; and,
- to enrich the quality of life by improving the science and technological literacy of children and adults so they are informed about the implications of SMT in their everyday lives; are motivated to pursue further experiences in these areas; and are aided in making informed, responsible decisions about related policy issues having societal implications.

The ISE program especially encourages projects that—

- reflect and apply recent research in SMT education;
- contribute to strengthening the infrastructure of informal science education through such activities as electronic networking, technical assistance, and professional development;
- conduct research on the informal education process to determine the effectiveness of innovative techniques for motivating and informing the public about topics in science, mathematics and technology; and,
- incorporate new material into existing programs so as to increase the science, mathematics, and technology interests and literacy of their audiences.

PROJECT CHARACTERISTICS

ISE projects provide rich and stimulating opportunities outside formal classroom settings where individuals of all ages, interests, and backgrounds can increase their appreciation and understanding of science, mathematics, and their applications. Supported projects include, but are not limited to: television series and programs for youth or for the general public; films on science and mathematics topics; exhibits or educational programs at science and natural history museums, science-technology centers, aquaria, nature centers, botanical gardens, arboreta, zoological parks, and libraries; and educational programs and activities at community and youth centers.

Most ISE projects are designed to reach large audiences and to have significant regional or national impact. The program encourages development of projects that address critical needs for informal science education in less populated regions of the country. *ISE does not support local projects that reach relatively few people, nor does it support general operating expenses or capital development costs*. All projects are expected to disseminate effective designs or materials in order to maximize their impact. All ISE projects should also include plans for rigorous evaluation, based on comprehensive quantitative and qualitative information, in order to document program impact and demonstrate potential for dissemination and replication.

AREAS OF SPECIAL INTEREST

ISE will place special emphasis in the following areas over the next several years:

- ***Collaborations Linking Informal and Formal Education Communities*—**Successful collaborations, through the effective combination of diverse resources and expertise, can promote creativity and significantly broaden the impact of a project. ISE encourages development of collaborative

projects that bring together individuals and organizations from the formal and informal education communities. Such collaborations include, but are not limited to those (1) among organizations with informal education missions; (2) between organizations with formal and informal education missions; and, (3) among organizations in a common geographic area with similar goals and interests.

- ***Increasing Opportunities for Underrepresented***—Informal science education plays an important role in motivating the interest and participation of groups traditionally underrepresented in SMT and in increasing their access to quality materials. ISE encourages development of projects across a variety of performers (e.g., community-based organizations, museums, media) that will develop and implement new and innovative strategies to increase participation of minorities, girls/women, and youth from economically disadvantaged areas (e.g., inner cities, rural communities) in these disciplines.
- ***Increasing Involvement of Parents in Science and Mathematics Education***—Parents can be effective proponents for SMT education reform and play a critical role in promoting the success of their children in SMT through encouragement and understanding of their children's science and mathematics activities at home, in school, and in informal learning settings. ISE encourages development of projects that integrate components for improving parent understanding of, and attitudes toward, science, mathematics, and technology, as well as those that increase awareness of new approaches to teaching and assessing performance in these disciplines. Materials for parents should teach them effective ways to support their children's work in science and mathematics and actively involve them in inquiry-based, experiential activities that demonstrate the importance of these disciplines to everyday life.

SPECIAL CONSIDERATIONS

Cost-sharing. Expectations for cost-sharing depend on the scope and nature of the project. In most media projects, NSF may contribute up to one third of the total project cost. For museum and community/youth-based projects, NSF generally supports up to two-thirds of total project cost. The listed cost-share amount is integral both to the review and award decision for the proposal and becomes a condition of any resulting award.

PROPOSAL REQUIREMENTS

Preliminary Proposals. General requirements for preliminary proposal submission are included in *"Preparation and Submission of Proposals,"* page 31. A preliminary proposal is required and must be postmarked no later than three months prior to submission of a full proposal. Staff reviews will be returned within two months of receipt by the program.

Preliminary proposals should include a 100-word abstract that clearly identifies major features of the project. The proposal should describe: (1) the need being met, target audience, and the plan to reach that audience; (2) major project goals and their alignment with ISE goals; (3) essential features of project design, including a timeline for their accomplishment; (4) qualifications and commitment of personnel responsible for the disciplinary content and overall creation/production of the project, as well as advisory committee members (including a one-sentence description of qualifications and percent time of each devoted to the project); (5) evaluation plans (e.g., front-end, formative, summative); (6) dissemination plans for findings and developed materials; (7) linkages with formal education, if any, and how they will be supported; (8) a projected, total project budget with clear indication of the share being sought from non-NSF funding sources; and, (9) plans, if appropriate, to institutionalize the project to ensure continuation of its impact beyond termination of the NSF grant.

Full Proposals. Information on submission of full proposals (including planning grants, conference grants, and Small Grants for Exploratory Research (SGER) are contained in the *Guidelines* section, *"Preparation and Submission of Proposals."* The narrative should include results from prior NSF support, a project overview, goals and objectives, general project description, qualifications to conduct the project, anticipated results, as well as evaluation and dissemination plans. Substantive information essential to understanding the details of complex projects should be placed in supporting appendices with explicit reference in the narrative. Using the example of a television series, the narrative would outline the scope of the series, briefly describing the programs (outlines, treatments, or scripts would be included in an appendix); provide a general description of evaluation plans (detailed plans would be in an appendix); and describe major elements of outreach plans (detailed plans would be in an appendix). While NSF does not require reviewers to read appendices, ISE reviewers are asked to read any materials explicitly referenced in the proposal narrative.

ISE Supplements for Public Understanding of Research. *ISE will fund as many as 30 supplements of up to $50,000 to NSF research directorate grants*. These supplements are intended to inform the general public about the content, process, and relevance of state-of-the-art research. Interested PI's with active research grants should contact their Program Officer in the research directorate for information about the requirements for these supplements and procedures for applying.

PARENT INVOLVEMENT IN SCIENCE, MATHEMATICS, AND TECHNOLOGY EDUCATION

Target Dates for Proposals

Full—*October 15*; **Preliminary, No Later Than—***July 15*

Telephone: 703-306-1616

INTRODUCTION

Parents, including individuals serving as parent surrogates (e.g., other relatives, foster parents, day-care providers), play a critical role in ensuring their children's interest and achievement in science, mathematics, and technology. Well-informed parents have many opportunities to teach their children; reinforce their curiosity; and provide encouragement and support for learning. In addition, parents are instrumental in ensuring the maintenance of a quality education system that meets the needs of all children. In keeping with its mission to support the nation's scientific and engineering infrastructure, NSF makes a major investment in pre-kindergarten to grade 12 (preK-12) education. A part of that investment supports projects that:

- stimulate parents to become informed, active proponents for high quality and more universally available SMT education in both school and non-school settings; and,
- provide strategies, materials, and resources for parents to support their children's SMT education in the home and elsewhere.

In support of these objectives, the ISE, IMD and TE programs will fund projects that are targeted on parents/surrogates and meet the overarching goals of their programs. Projects are expected to develop innovative materials and strategies that will actively engage large numbers of parents in their children's education, as well as in education reform. To maximize impact, all projects should yield effective products and models that can be disseminated and/or replicated in other locations.

PROJECT CHARACTERISTICS

Eligibility. Organizations with a scientific and/or educational mission are encouraged to submit proposals. These include community-based organizations that specifically provide family services, museums, libraries, media organizations, professional societies, school systems, colleges and universities, private foundations, publishers, and other public and private organizations whether for profit or not-for-profit.

Content. To be considered viable and to ensure that they will make a contribution to the field, ISE projects should incorporate the following elements—

- clearly defined target audience(s), effective strategies for recruitment and involvement of participants (especially those heretofore not engaged in their children's SMT education), and plans for engaging participants in project activities;
- goal statements that clearly and realistically describe expected impact on the target audience(s). Among desired outcomes are those that provide parents with resources and skills to continue their own involvement in SMT education, to keep abreast of SMT education issues, and to continue as supporters of their children's education and quality SMT education in general;
- innovative, accurate, and up-to-date SMT content; demonstrated knowledge of adult learning strategies; and knowledge of science and mathematics education reform;
- solid partnerships and collaborations with community-based organizations and agencies that serve families and youth, schools, the informal science community, colleges and universities, industry, and, where appropriate, NSF systemic initiative projects;
- inclusion of parents and/or appropriate community-based organizations in project planning;
- active participation of scientists, mathematicians, and technologists;
- evaluation that provides good qualitative and quantitative reporting on project outcomes; and,
- dissemination that ensures maximum impact.

Duration. Projects of up to five years in duration will be considered.

Funding. Total annual funding for projects is estimated at $3 million, depending on the availability of funds.

Cost-sharing. Cost-sharing is required for all projects; is a factor in evaluating proposals; and will be a condition of a resulting award. For broadcast media projects, NSF generally contributes one-third of the total project cost. The level of cost-sharing must be shown in the proposal in enough detail to allow NSF to determine its impact on the proposed project.

EVALUATION AND DATA COLLECTION

All projects (with the exception of planning grants) are expected to incorporate formative and summative evaluations that are commensurate with the nature and scope of the proposed activities. Final project reports are expected to provide strong qualitative and quantitative evaluation that will detail the level of success of the project and identify effective strategies. Where appropriate, project evaluation should include the following:

Formative Evaluation. Formative evaluation is designed to

provide information that improves project performance and assesses whether the project is being conducted as planned and making progress in meeting stated goals. Formative evaluation activities may include:

- pilot and field-testing of materials and activities to ensure accuracy and effectiveness; and
- testing, assessment, and revision of implementation strategies.

Summative Evaluation. Summative evaluation assesses project success after the project's impact has been realized. Information sought from summative evaluation includes:

- the extent to which the project met overall goals and objectives;
- the effectiveness of design and implementation, including information on strengths and weaknesses;
- the level and nature of the impact on target population(s) and the community;
- those strategies that were most effective in reaching, and securing commitments from, target population(s);
- the cost-effectiveness of the project and the likelihood that it can be replicated and transported to other locations; and, other outcomes of interest that are uniquely related to the project.

SPECIAL REVIEW CRITERIA

Proposals will be reviewed in accordance with established Foundation procedures and review criteria as described in the review section of this announcement, as well as the following specific criteria:

Plan. Is the project plan informed by sound research or evidence of promising practice in the area of parent involvement in education? Where appropriate, is the plan in alignment with, and does it draw upon, local and state education reform efforts.

Impact. What difference will the project make to parents and other adults who wish to help their own and other children increase their involvement and enhance their understanding of SMT? For those who wish to develop knowledge and skills to be proponents of high quality education at the school building, district, or other levels, what are the indicators that confirm they have attained these capabilities?

Scope. Does the project have the potential to reach a large number of parents and have a regional or national impact? Does the project include a satisfactory plan for disseminating the material and activities?

PREPARATION OF PROPOSALS

Preliminary Proposals. A preliminary proposal is required for submission of a full proposal. General requirements for preliminary proposal submission are included in *"Preparation and Submission of Proposals,"* page 31.

The preliminary proposal should include a 100-word abstract that clearly identifies essential features of the project. It should convey information about (1) goals and objectives, the need being met, target audience, and the strategy for reaching that audience; (2) project design, anticipated products/outcomes, and a timeline for implementation; (3) all key staff and major partners with brief descriptions of their qualifications, roles, and levels of involvement; (4) plans for evaluation, (e.g., front-end, formative, summative, pilot/field testing of materials); (5) plans for dissemination/distribution/replication of developed products and/or strategies; and (6) the proposed budget indicating the percentage of the budget being sought from non-NSF sources.

Full Proposals. General requirements for submission of full proposals (including those for planning grants, conference grants, and Small Grants for Exploratory Research (SGER)) are included in the section, *"Preparation and Submission of Proposals."* The proposal narrative should include results from prior NSF support, project overview, goals and objectives, general project description, qualifications to conduct the project, anticipated results, as well as evaluation and dissemination plans.

***Planning Grants*—**For those applicants with well-developed ideas and project plans, but requiring resources to refine project design, partnership/collaboration arrangements, implementation plans, budget requirements, and/or assessment plans, planning grants for a maximum of one year and $50,000 will be considered. Full proposals resulting from planning grants require a preliminary proposal.

INSTRUCTIONAL MATERIALS DEVELOPMENT PROGRAM

Target Dates for Proposals

Full—*August 15*; **Preliminary, No Later *Than*—***May 1*

Telephone: ***703-306-1614***

GOALS AND OBJECTIVES

The Instructional Materials Development (IMD) program supports development of curricula, assessments, and strategies designed to improve science, mathematics, and technology (SMT) instruction at all education levels (pre-Kindergarten through grade 12), as well as to improve interfaces between secondary school and college. Projects range from substantial revision of existing materials to creation of entirely new ones; from development of a single module~~s~~ at an instructional level to comprehensive curricula for several school years; from addressing a single subject to the integration of several disciplines; and, from assessments embedded in instructional materials to creation of items and assessment programs that can be used by districts and states. Projects should promote development and implementation of curricula and materials that are aligned with content, teaching, and assessment standards for science and mathematics and, as appropriate, incorporate the latest educational technologies. While projects focus on development of student materials, they also may include related supplementary instructional guides for teachers and parents that are designed to promote materials adoption and implementation.

Products should be designed to ensure success of ***all*** students, regardless of background, ability, or future educational plans. They should promote students' positive attitudes toward SMT and positive perceptions of themselves as learners. Projects are expected to be national in scope and significance so that, upon completion, materials will be ready for utilization by teachers and students across the nation. Evaluation should be designed to document changes to student learning outcomes; improvements in performance and participation in SMT of female and minority students; and modifications in instructional approaches that are prompted by the new instructional materials. Proposals should describe clearly how objectives will be addressed in monitoring project performance and evaluating project success.

IMD also encourages innovative, high risk projects that develop and test prototypes of instructional materials and learning technologies that apply the most current research on teaching and learning. Such projects must demonstrate promise for advancing the state-of-the-art in curriculum development and for testing the limits of instructional materials in promoting student understanding of science, mathematics, and technology.

PROJECT CHARACTERISTICS

Proposed materials are expected to be aligned with national standards and state frameworks in science and mathematics and to exhibit the following design characteristics:

- potential for broad impact (e.g., national scope and/or significance) and for making positive changes in instruction that will be long-term in nature;
- grounding in the most recent advances in research in teaching and learning;
- ability to develop students' critical thinking and problem-solving abilities at increasing levels of complexity;
- focus on innovative, accurate, substantial, and up-to-date content informed by practicing scientists, mathematicians, and engineers, as well as SMT educators;
- incorporation of assessments and accompanying materials that instruct teachers on their use and implementation;
- inclusion of culturally relevant and real-world examples, appropriate role models for career-awareness, and attention to diverse learning styles to promote the success of ***all*** students, especially those from underrepresented populations;
- opportunities for active involvement of students and teachers in investigations and experiments that lead to shared common understandings of fundamental concepts and principles;
- emphasis onsupon depth of study, rather than breadth of material;
- incorporation of ion ofinstructional technologies to provide learning experiences that enhance student understanding and application of key disciplinary concepts;
- opportunities for students to strengthen their communication skills; and,
- connections within and among SMT disciplines, and other areas of study.

AREAS OF SPECIAL INTEREST

IMD will place special emphasis on the following areas during the next several years:

- **Development of comprehensive science curricula at the middle- and/or high-school levels.** IMD will support development of curricula that cover one or more years of study at the middle- and/or high-school level. Comprehensive science curricula should provide for development of student knowledge through an identified sequence of concepts and skills in accordance with national standards.
- **Revisions to exemplary materials.** IMD will support major revisions to exemplary instructional materials to align them with national standards for science and mathematics. Focus is on enhancements to content, pedagogy, stu-

dent assessment, teacher development, and program and system standards. Revisions also will be considered that include advances in educational technologies that support new ways of learning, as well as those that emphasize processes of design and systems analysis to promote deeper understanding of science and mathematics concepts and integration of SMT content. Since materials to be revised are currently commercially available, developers must show specific and substantial cost share in an amount greater than the funding level requested from NSF.

- **Assessment of student learning.** IMD will support development of various tools (e.g., portfolios, item banks, performance tasks) to assess ***and guide*** student learning at the classroom level. The program also will support development of strategies for monitoring gains in Science Educationstudent progress at classroom, district, and state levels.

In addition, IMD encourages submission of proposals in the following emerging areas:

- **Early childhood education (pre-kindergarten through grade 2).** IMD will support development of instructional materials that provide a range of alternative SMT learning opportunities for young children in home, day-care, and formal school environments. Materials should be based on the latest research reflecting how young children learn most effectively and their development should be a product of the input and sustained involvement of professionals knowledgeable in early childhood teaching strategies, curriculum development, and disciplinary content.
- **Student research activities in the classroom**. IMD will support leading scientists and SMT educators in developing modules for student research activities that are age-appropriate, rich in disciplinary content, and able to be integrated with grade-level curriculum. Such materials must be pilot- and field-tested in diverse classrooms settings. Materials may, for example, involve students in large-scale research projects that include gathering, manipulating, and communicating data from natural phenomena. Modules must target particular areas of study; clearly identify research questions to be addressed; utilize appropriate scientific, computational, and educational technologies; and include professional development materials for teachers.

PROPOSAL REQUIREMENTS

Preliminary Proposals. A preliminary proposal is required for submission of a full proposal. General requirements for preliminary proposal submission are included in *"Preparation and Submission of Proposals,"* page 31.

Preliminary proposals should include a 100-word abstract that identifies essential features of the project, its disciplinary focus, and its grade level. The preliminary proposal should provide (1) a general description of the materials, including disciplinary and pedagogical characteristics; (2) a workplan; (3) evaluation and dissemination plans; (4) brief curriculum vitae of key personnel (e.g., educators, researchers, evaluators) to be involved in the project; and, (5) a projected budget, disaggregated by major categories (e.g., salaries, equipment, supplies, travel, other direct costs, and indirect costs) and other potential funding sources; and, (6) a timeline.

Full Proposals. For information on requirements for proposal submission, see section, *"Preparation and Submission of Proposals,"* page 31. Major sections of the proposal are as follows:

Proposal Narrative. The proposal narrative presents most information that determines whether or not a grant will be awarded, including the following:

- ***Results of Prior NSF Support.***
- ***Need/Content Area—***a clear and concise description of the relevant issues to be addressed that relate to instructional materials within the broader context of elementary, middle, and secondary education and evidence that the proposed materials fill a need of teachers and schools throughout the nation.
- ***Goals and Objectives—***a description of project goals and objectives, clearly indicating innovative aspects.
- ***Content and Pedagogical Strategies—***a major part of the proposal should describe the disciplinary content and pedagogical strategies embedded in the materials. Relevant experts should be able to judge the suitability of the materials for the intended audience in the academic setting described.
- ***Potential Impact and Significance—***identification of the target audience and its particular needs; discussion of how instructional materials will be improved and why outcomes will be of interest/use to a wider community of educators; identification of mechanisms for securing long-term impacts if stated goals include continuation and maintenance of activities by local institutions or self-sustaining networks after NSF funding ends. The project's disciplinary and pedagogical aspects will be assessed with respect to anticipated impact on SMT education.
- ***Procedure and Methods—***a description of the experience and capability of the PI's, a plan and timeline for project implementation, and resources available for realizing project objectives. This section should:
  - — demonstrate awareness of how others have addressed the same or similar questions and reference relevant literature to show knowledge of disciplinary and pedagogical issues, as well as s;
  - — describe how the instructional materials build on, and relate to, previous and on-going efforts in the field;
  - — describe how the instructional materials build on the preparation of students at previous grade levels and better pre-

pare and motivate students for continued study in SMT at higher grade levels;

— describe the process to be used for writing, content review, pilot tests, field tests, formative evaluation, and selection of final material. Materials should be pilot tested locally with lead teachers with evaluation results reflected in revisions. Field tests should include a broad range of teachers serving students of diverse backgrounds. The results of field tests should be presented in a format that can be used for marketing materials and submitted to NSF for review. Successful materials development generally results from collaborations of practicing scientists, science educators, and teachers.

— describe specific lessons, experiments, student projects, course work, assessment materials, or new modes of instruction to be developed; how these can be integrated into existing curricula, as appropriate; and required resources (e.g., computer expertise) at the school level to implement them. Specific examples should be included in an appendix.

— describe the expected impact on students, especially those from population groups that are underrepresented (e.g., women, minorities, persons with disabilities) and underserved (e.g., rural, inner city).

- ***Anticipated Results***—a description of knowledge that may be gained and the materials produced (e.g., workbooks, texts, software, videos, CD-ROM, scholarly publications, monographs).

- ***Pilot and Field Tests***—Successful materials are developed in collaborations of practicing scientists, science educators, and teachers. Materials should be pilot tested locally with lead teachers and this experience should then be reflected in revisions. Field testing should be done with a broad range of teachers serving students of diverse backgrounds.

- ***Evaluation***—a description of the qualification of individuals who will (1) conduct project evaluation; (2) advise on the project's concept and conduct; and (3) assess the quality of the materials. The independence of such individuals from the PI and/or Project Director should be evident. Information should be provided on criteria for evaluating the quality and impact of the project (e.g. assessment of student learning, pilot and field testing) and procedures for collecting and analyzing quantitative and qualitative information. Evaluators should assist in identifying key concepts and processes that should be learned and applied by students, as well as in monitoring progress toward achieving project goals. The evaluation plan and composition of an advisory committee should be appropriate for the size and complexity of the project.

- ***Dissemination***—a description of plans to communicate project results to other professionals in SMT education communities both during and after the project and to disseminate products. All IMD curriculumcuriculum projects must becomemrcially commercially published and distributed. Proposals should identify the names of commercial publishers who have expressed an interest in the materials, or present a timeline for securing a publisher within the first two years of development. Dissemination plans that include potential sales income should describe the disposition of that income in the proposal; if no income is anticipated, a statement to that effect should be included.

Budget. NSF expects majority of project costs to support personnel time and personnel-related costs; modest requests to support acquisition of materials, supplies, equipment, computing services, etc. are allowable. Performers are expected to have the majority of computing facilities, equipment, and physical environment to achieve project goals. IMD will not fund purchase of classroom equipment necessary to implement developed materials.

- ***Eligible Costs***—The budget should include only items representing new design and development costs. NSF funds may not be used to support expenditures that would have been undertaken in the absence of an award, such as costs for normal teaching and materials development activities.

- ***Cost-Sharing***—Expectations for cost-sharing depend on the scope and nature of the project. Commitments may be in the form of funds, equipment, personnel time, etc., and may be provided from the submitting institution, schools/school districts where the materials are to be implemented, or other non-Federal sources. Equipment costs must be matched by non-Federal funds greater than funds requested from NSF. The listed cost-share amount is integral both to the review and award decision for the proposal and becomes a condition of any resulting award.

Special Categories of Full Proposals. IMD also accepts proposals for planning grants, conference grants, and Small Grants for Exploratory Research (SGER) which may be submitted to the program at any time. For further information see "Preparation and Submission of Proposals."

Final Reports/Materials Submission. A complete set of materials is to be submitted to IMD along with the final report. When they become available, the final published copies should be submitted to both IMD and the Eisenhower National Clearinghouse. Interim drafts of materials may be requested at any time by IMD staff for review.

IMPLEMENTATION AND DISSEMINATION PROJECTS

Target Dates for Proposals

Full—*August 15*; **Preliminary, No Later *Than*—***April 1*

Telephone: 703-306-1614

GOALS AND OBJECTIVES

Science and mathematics education reform requires classroom implementation of high-quality, standards-based instructional materials, together with a comprehensive program of professional development for teachers and the alignment of school district policy, practice, and resources. For those districts that have decided to implement NSF-supported exemplary materials, the IMD and TE programs seek to establish implementation sites that will provide information and technical assistance to decision-makers who are responsible for selecting materials and ensuring their implementation. These sites should increase awareness of alternatives; identify strategies for selection of materials that are appropriate for their needs; and provide the technical assistance necessary for broad-scale implementation.

Projects should be national or multi-state in scope and must provide multiple curriculum offerings. The site should be defined in terms of : (1) content areas (i.e., science, mathematics, technology), (2) grade levels (i.e., elementary, middle, secondary), and (3) instructional materials to be supported. Sites must have the capability of assisting schools/districts with needs assessments that enable the selection of appropriate materials. Depending on its focus, a site would provide some or all of the following:

- assistance in determining the critical local factors entering into the selection and adoption of the instructional materials;
- assistance in assessing the alignment of the instructional materials with national standards and school, district, and/or state curricular frameworks;
- assistance in assessing the alignment of instructional materials across grade levels and, as appropriate, between science and mathematics;
- planning of professional development that prepares and supports teachers in the use of the instructional materials;
- identification or development of tools (e.g., professional development materials, assessment packages, resource guides) that support the necessary teacher enhancement;
- assistance with identification of and access to resources (e.g., demonstration sites, videos, simulations) for observation of teachers and students in classroom settings that model the exemplary implementation of the materials;
- strategies to identify and build the partnerships needed to support school change that enables the adoption and implementation of exemplary instructional materials;
- minor revisions to instructional materials, as appropriate, that facilitate articulation between grade levels;
- enhancement of potential staff developers in the implementation of the curricular materials; and,
- assistance in determining the critical factors needed to make decisions about appropriate educational technologies and student assessments to implement the new instructional materials.

Sites are expected to provide directly some of the services above, but serve only as a clearinghouse for others. Project partners should include local and state education agencies, institutions of higher education, publishers, and/or other organizations that can demonstrate a record of educational excellence and leadership in curriculum implementation and related teacher enhancement, as well as knowledge of school district policy and practice that affects curriculum implementation. Sites are expected to obtain a significant part of their funding through cost-sharing supplied by publishers of the instructional materials, school districts served by the site, and other appropriate organizations. Proposals should include plans for development of funding sources sufficient to sustain the project beyond the expiration of the NSF grant.

Eligible Institutions and Departments. Organizations with a science and/or mathematics education mission are eligible to submit proposals. These include: colleges and universities, state education agencies, professional societies, private foundations, private industry, publishers, and other public and private organizations whether for profit or not-for-profit. Proposers are strongly encouraged to build meaningful partnerships.

Funding and Duration. Project duration is expected to be from three-to-five years, with an award amount not to exceed $1.4 million annually. The maximum total request of any one project should not to exceed $6 million. Costs of participating in sites activities are generally expected to be borne by the districts or agencies served. In cases where costs are to be borne by the project, proposals must provide a rationale for the necessity of such support.

Proposals will be reviewed in accordance with established procedures, the four general criteria described in ***GPG*** **(NSF 95-27)** and the following special criteria:

— well-articulated objectives and rationale for selecting clients, instructional materials, and the range of activities to support dissemination and implementation of the materials;

— potential for establishing effective working relationships with school districts that (1) are in the exploratory

phase of an educational reform initiative and need information on state-of-the-art instructional practices and curriculum content, (2) need assistance in understanding differences in alternative instructional models and materials in order to design and implement their own project, (3) require mentoring by leaders of model projects so they can adapt activities to their local needs, and/or (4) need advice and support as they implement their own initiative;

— potential of the partnership to provide technical assistance which applies a broad knowledge base including state-of-the-art information on curricular models and the related needs for professional development, student assessments and application of educational technologies, and research in teaching and learning;

— demonstrated awareness of alternative strategies for achieving equity and outreach directed to areas with high minority or underserved populations; and,

— well-developed indicators for formative and summative evaluation, as well as project monitoring that demonstrate progress, effectiveness, and success.

PROPOSAL REQUIREMENTS

Preliminary Proposals. Preliminary proposals are required to be eligible for submission of a full proposal. General requirements for preliminary proposal submission are included in *"Preparation and Submission of Proposals."* Preliminary proposals should be received as early as possible—but postmarked no later than April 1st; the NSF response will be returned within ten weeks of receipt by the program.

Preliminary proposals must include a 100-word abstract that clearly summarizes major features of the project. Proposals should describe (1) project scope and objectives; (2) the need of the population being served; (3) a workplan that covers the range of activities being supported to meet objectives; (4) project strengths in terms of content, available resources, partnerships; (5) relevant expertise of key personnel; (6) plans for evaluation; (7) total budget by major category (including other potential sources of support); and, (8) a timeline for major deliverables.

Full Proposals. For information on submission of full proposals, see "*Preparation and Submission of Proposals*" in these *Guidelines.* Full proposals (including those for planning grants) must strictly adhere to the page limitation and formatting requirements. Appendices may be used to provide information relevant to the project. Appendix material should be clearly referenced in the proposal. Please note that reviewers are not required to read appendices.

TEACHER ENHANCEMENT PROGRAM

Target Date for Proposals

Full—*September 2;* **Preliminary, No Later Than—***April 1*

Telephone: 703-306-1613

PROGRAM GOALS

The Teacher Enhancement (TE) program supports professional development projects to broaden and deepen the disciplinary and pedagogical knowledge of teachers. Projects typically involve administrators and others who play significant roles in providing quality science, mathematics, and technology (SMT) education in order to promote supportive school cultures, enabling teachers to engage all students in rich and challenging learning environments.

To accomplish its goals, TE encourages the following major proposal categories: (1) *Local Systemic Change* projects for SMT education, grades K-8, and mathematics, grades 7-12; (2) teacher leadership projects; (3) teacher enhancement through research experiences, including prototype projects involving both teachers and students; (4) replication and scale-up; (5) professional development materials; and, (6) professional support for the teaching workforce. Proposals are especially encouraged that target greatest need (e.g., geographic areas with high percentages of underrepresented and underserved populations—urban, rural, and resource-poor school districts). It should be noted that the TE program requires that professional development be aligned with the curriculum and instructional materials used in participant schools. **TE does not support development of curriculum or instructional materials for students.**

TE will also support a few innovative, high risk projects that are designed to contribute to new paradigms for improving SMT education, grades K-12. Such projects would develop and test new models that show promise of advancing the state-of-the-art in the professional development of teachers, teacher leaders, and/or professional developers. Proposals for these innovative projects must include (1) a clear description of the new model and strategies to be developed and tested; (2) a review of the relevant research base; (3) a thorough evaluation plan which may be augmented by a companion plan for research into particular questions of interest related to teacher enhancement; and, (4) a detailed plan for disseminating and implementing findings within the professional development community at large. Of particular interest are projects that use technology to reach more teachers and that make exemplary curriculum and support materials available to them. The TE program encourages projects that teach teachers to use curriculum materials that incorporate technology and those that provide tools that empower teachers to reflect on, analyze, and improve on their practice.

All TE projects should address well-defined needs; deliver professional development that incorporates quality standards for content, instruction, and assessment in SMT education; and recognize the critical role of teachers in promoting competence, interest, and enthusiasm for study in these fields. In addition, such projects should model the inquiry-based instructional strategies recommended for students. The following outcomes are considered essential for all TE projects:

- teacher education that leads to improved understanding of disciplinary content, instructional practice, and the use of assessment for enhancing classroom effectiveness;
- engagement of schools, parents, and communities as proponents for the support of long-term educational improvement and continued professional development of teachers;
- commitment of key members of the school community to ensure local and state support for education, policies necessary for education reform, and incentives for teachers to pursue continued professional development;
- integration of educational technologies and networking in order to increase access to high quality education and better adapt instruction to different learning styles; and,
- implementation of a cost-effective strategy (based on reasonable costs-per-teacher given both the duration and quality of professional development) that ensures potential for replication and scale-up and contributes to program accountability.

1. LOCAL SYSTEMIC CHANGE PROJECTS[2]

Local systemic change (LSC) projects support school systems and their partners in reforming delivery of: (1) science and/or mathematics education, grades K-8, or (2) mathematics education, grades 7-12. Such projects are expected to initiate systemic efforts that will make significant progress in implementing recognized standards for content, teaching, and assessment.

LSC projects represent a shift in focus from professional development of individual teachers to that of all teachers within an entire school organization. Projects should result in the establishment of professional communities which empower teachers to change practice and reflect on their own teaching and learning. In these projects, new beliefs, skills, and behaviors are learned and explored within a supportive school culture which is itself engaged in renewal.

[2]These Guidelines supersede the special solicitations, ***Local Systemic Change Through Teacher Enhancement— Grades K-8 (NSF 94-73) and Local Systemic Change Through Teacher Enhancement in Mathematics—Grades 7-12 (NSF 95-145).***

LSC Project Characteristics.

- ***Eligibility*—**School districts or coalitions of school districts in partnership with at least one organization with a scientific or educational mission may submit proposals. Among the latter are: colleges and universities, state and local education agencies, professional societies, research laboratories, private foundations, and other public and private organizations whether for-profit or nonprofit.
- ***Focus*—**While projects must be clearly placed in the context of a comprehensive strategy for grades K-12, they may address a component of that system. For example, LSC projects for science and mathematics, grades K-8, could target all K-8 teachers of science and/or mathematics or a subset (e.g., all science teachers, grades K-5; all mathematics teachers, grades K-8; all science and mathematics teachers in a particular set of schools within a large system).[3]

  LSC projects for mathematics, grades 7-12, could target all mathematics teachers at those grade levels or a subset (e.g., all mathematics teachers, grades 9-12, or all mathematics teachers, grades 7-12 in a particular set of schools within a large system). Projects may include teachers of grades 5-6 if the school environment is designed around clusters having a disciplinary focus (as opposed to self-contained classrooms where teachers have responsibilities for all subject areas) and if these teachers are part of a comprehensive project that impacts middle and/or secondary mathematics.
- ***Coverage*—**LSC projects for SMT education, grades K-8, must include at least 200 teachers, each engaged for no less than 100 hours of intensive professional development activities over the duration of the project. Similarly, projects for mathematics, grades 7-12, must include at least 100 teachers, each receiving no less than 130 hours of intensive professional development activities.
- ***Duration*—**Duration of LSC projects is expected to be from three-to-five years.
- ***Funding Levels*—**LSC projects focused on SMT education, grades K-8, may request up to $1.2 million for each year of the project—the maximum being determined by multiplying the total number of teachers reached over the course of the project by $3,000. LSC projects targeted on mathematics, grades 7-12, may request up to $1.0 million for each year of the project—the maximum determined by multiplying the total number of teachers reached over the course of the project by $4,500. Not all teachers need the same amount or type of professional development, nor will all professional development require the same amount of NSF support; the allowable cost-per-teacher can therefore be an **average** across those project participants who engage in at least the required experiences of 100 hours for grades K-8 or 130 hours for mathematics, grades 7-12, within the duration of the grant. For example, strategies may vary by heavily investing in development of mentors or lead teachers or in providing additional resources to strengthen content background of under-prepared teachers.
- ***Allowable Costs*—**NSF funds are intended to support teacher enhancement activities, not the actual costs of putting selected curricula in classrooms. Proposals must indicate the amount and source of funding for the following: classroom instructional materials, equipment, and supplies (none of which may be supported with NSF funds); ongoing support for teachers beyond the NSF funding period; and long-term evaluation. In situations where networking technology would help sustain professional development opportunities for teachers, equipment purchase will be considered within the allowable funding level (i.e., as determined by the product of total number of teachers and average cost-per-teacher over the course of the project) so long as other requirements are met.
- ***Cost-sharing*—**Cost-sharing from school systems, state funds, and the private sector, higher education, and other partners is required for all projects. Only items allowable under applicable cost principles, if charged to the project, may be included as the grantee's contribution to cost-sharing (see ***GPG* (NSF 95-27)**). Classroom materials, equipment, and supplies—the purchase of which may not be supported by NSF funds—will be allowed as cost-sharing. The listed cost-share amount is integral both to the review and award decision for the proposal and becomes a condition of any resulting award. For further information, see section on "Preparation and Submission of Proposals," page 31. Documentation of actual cost-share must be submitted with each annual report and will affect the decision made regarding the next funding increment.
- ***Evaluation*—**LSC projects must participate in a standardized, core evaluation that allows assessment of each project's progress toward attainment of quality standards for SMT teaching; aggregation of data/information across projects; and cross-project analysis. The core evaluation consists of a data collection framework (including a set of instruments and procedures). It ensures program accountability and provides a basis for assessing progress on which continued project funding will depend.

  The core evaluation calls for collection of both qualitative and quantitative data and requires roughly 50 days of staff time, depending on the number of teachers and schools par-

[3]A city with an NSF Urban Systemic Initiatives (USI) award is eligible to apply for an LSC project provided that it would implement large-scale professional development integral to the overall USI reform strategy and that it is strongly endorsed by the PI of the USI project. Projects in USI cities at the K-8 grade level must target both science and mathematics instruction.

[4]The standardized evaluation is designed to assess the impact of the project on classroom practice and will address such issues as: (1) the overall quality of professional development activities; (2) the extent of teacher involvement in the LSC activities; (3) the impact of the LSC on curriculum, instruction, and assessment; (4) the likelihood that the proposed professional development system will be sustained; and, (5) the level of support for teaching.

ticipating in the project.[4] Each project must designate a lead evaluator to serve as liaison with the NSF contractor and to oversee data collection. Core evaluation activities may be carried out by others (e.g., consultants and/or district employees) with evaluation expertise. Projects may supplement the core evaluation activity to collect site-specific data. NSF Program Officers should be contacted for updated information on the NSF evaluation activity.

Receipt of Continuing Grant Increments—No continuing grant increments will be made for LSC projects unless the PI remains up to date with requirements of the core evaluation.

LSC Special Proposal Review Criteria. The reform strategy employed in LSC projects should be aligned with nationally recognized content, teaching, and assessment standards for SMT education, as well as with existing state frameworks, as appropriate. Successful projects must also align policy and practice. Proposals will be reviewed in accordance with procedures described in the ***GPG* (NSF 95-27)**, as well as the following specific criteria:

- ***Vision***—The project must be based on a shared, comprehensive vision of science and mathematics education reform among major stakeholders **and** a professional development strategy that is clearly articulated for grades K-12. The vision should include goals and objectives for student learning and incorporate national and state standards for curriculum, teaching practice, and assessment. LSC projects for SMT, grades K-8, should address science and/or mathematics comprehensively; mathematics, grades 7-12, projects must articulate a vision for K-12 mathematics.
- ***Needs Assessment***—The proposed strategy must be based on a realistic assessment of the system's strengths and weaknesses. Such assessments should identify: teacher needs based on the current status of instruction and the chosen curriculum; staff and material resources available to support the reform effort; related activities (both NSF and others) impacting the system; and state and local policies directly influencing instruction.
- ***Curriculum Implementation***—Participating school districts must identify the curriculum to be implemented or submit a list of options accompanied by criteria for selection. Curricula alternatives must be exemplary and field-tested; the selection process must be completed during the first year of the grant. Instructional materials to be implemented must be exemplary and field tested. If these materials are not nationally recognized, representative samples should accompany the proposal to demonstrate content accuracy and soundness of instructional practice. The professional development strategy and resource levels must be adequate to implement selected curriculum across the system.
- ***Strategic Plan***—Project design must be consistent with the articulated vision for K-12 SMT education. The plan should be based on: current research on teacher and system change; effective teacher enhancement models; selection of existing, exemplary instructional materials and programs; appropriate student assessment; effective use of technology for students and teachers; follow-up and ongoing support for teachers after NSF funding ceases; and strategies for institutionalizing new programs and sustaining newly established partnerships.
- ***Cooperative Relationships***—The project should forge partnerships among higher education, business and industry, museums, media, and other parts of the private sector that will support quality SMT education. Reasonable working relationships must be established and clearly evidenced in the proposal. The project should, whenever possible, capitalize on and coordinate with NSF investments in related education projects (e.g., other large-scale TE projects (current or recent past), State Systemic Initiatives (SSI), Urban Systemic Initiatives (USI), Rural Systemic Initiatives (RSI), NSF Collaboratives for the Preparation of Mathematics and Science Teachers).
- ***Cost-Sharing***—The project should leverage appropriate contributions from school systems, higher education, state agencies, private foundations, business and industry, professional societies, and local communities. While other Federal funds are not an acceptable source of cost-sharing under NSF reporting regulations, it is anticipated that LSC projects will leverage and complement activities supported with other Federal funds, in particular Title I and/or Eisenhower. Use of these funds should be described in the budget explanation, separate from the cost-sharing information. Cost-sharing will be considered in evaluating proposals and will be a condition of any resulting awards. Documentation of actual cost-share must be submitted with each annual report and will affect the decision made regarding the next funding increment.

2. TEACHER ENHANCEMENT LEADERSHIP PROJECTS

Through leadership projects, teachers obtain a thorough background in appropriate content and pedagogical knowledge; knowledge of quality curriculum materials and educational technologies; knowledge of the process of educational change; and knowledge and skills of leadership. Participants also receive follow-up support to implement classroom improvements and/or to conduct leadership and staff development activities. Typical leadership projects exceed the equivalent of four-to-six weeks in duration. They may involve multiple-year work through summer institutes and/or academic year programs. Projects must include adequate time for in-depth study, reflection, and guided practice and should model effective approaches to curriculum, teaching, and assessment. Generally, each participant's school or school district is expected to provide sufficient time and resources to enable them to apply their leadership knowledge and skills in support of mathematics and/or science educational reform.

Categories of Projects. Leadership opportunities will be provided (1) to prepare teachers to serve as building or district mentors and/or change agents responsible for supporting program

improvement and (2) to prepare teachers for roles as members of teams that provide professional development for their colleagues and make a broad contribution to the infrastructure that supports science and/or mathematics educational reform. The two categories are:

a. *Teacher Leader Projects*—These projects are intended to develop master teachers and/or intellectual leaders who have the preparation in content, curriculum, and assessment necessary to actively support school program improvement. Participants should both learn and practice the skills necessary to facilitate change as they implement SMT program improvements. Projects should target SMT teachers at the middle- and high-school levels. It is anticipated that projects with the potential for greatest impact would draw participants from districts or a consortium of schools. In addition to teachers, leadership teams may also include building and district administrators, and other appropriate support personnel.

b. *Regional/District Capacity Building Projects*—Regional/District Capacity Building projects create staff developers who can build the infrastructure for science and mathematics education reform. Such individuals should possess the necessary knowledge and skills to engage in the planning, implementation, and evaluation of professional development activities that support SMT education reform. Projects should provide participants with advanced disciplinary content and related pedagogy, leadership development, adult learning, program development, supervision, and knowledge about the process of educational change. Projects should also provide follow-up support to participants as they implement staff development activities. Participants are expected to be master teachers (grades K-12), district leaders, school staff developers, university faculty in education, mathematics, science or technology.

Budget. Projects must be cost-effective and include strong cost-sharing commitments. Proposals may request no more than $400,000 per year, with a maximum annual cost of $5,000 per participant. NSF funds may be applied, in part, to supplement participant salaries, but the majority of funds should be applied to in-service activities, and should include project evaluation.

Evaluation Criteria. In addition to standard evaluation criteria used by the TE program, Leadership projects will be evaluated by the intensity, quality, and follow-up support provided by the professional development strategy, as well as cost-effectiveness.

3. TEACHER AND STUDENT DEVELOPMENT THROUGH RESEARCH EXPERIENCE PROJECTS [5]

The integration of research and education is a powerful paradigm for SMT education, bringing the excitement of discovery and the discipline of scientific inquiry. Such projects offer teachers and students the unique opportunity of working beside practicing scientific and technical personnel for personal growth and to develop research activities that can be transported back to classrooms to supplement formal curricula.

Categories of Projects. TE will support both projects that involve teachers as a means of professional development and those that involve teachers and students. Categories of projects include:

a. ***Research Experiences for Teachers Projects***—Teachers gain insight into scientific and technological processes when given the opportunity to work beside practicing scientists, engineers, mathematicians, and technologists in a research-rich environment. These opportunities refresh and deepen the teachers' understanding of SMT concepts and scientific processes.

Characteristics of Research Experiences for Teachers Projects—

— ***Eligibility.*** Higher education institutions, as well as advanced Federal and industrial research and development (R&D) facilities, may submit proposals individually and/or in collaboration. Selected project sites should provide participants with intellectually stimulating R&D experiences.

— ***Staff.*** Senior staff (e.g., those with major responsibility for teacher selection, supervision of research and pedagogical activities) should be college or university faculty; active researchers in science, mathematics, engineering, and technology employed in academia, industry, or Federally Funded Research and Development Centers (FFRDCs); educators in these disciplines; or education researchers. While the PI must provide intellectual leadership, a Project Director may be appointed to serve as liaison with NSF for purposes of administering the project. The proposal narrative must include a brief statement of the role and responsibilities of the PI, Project Director (if applicable), and other senior staff, including time commitment to the project and relevant qualifications. Staffing levels must allow for substantive one-on-one or small group interactions with participants. [NOTE: Any proposals under this category that originate from Federal agencies and FFRDCs may not include costs related to Civil Service Salaries for Federal scientists and engineers.]

— ***Recruitment.*** Participants must be recruited from among teachers (US citizens or permanent residents) of science, mathematics, and/or technology at the middle- or secondary-school level whose background and teaching assignments are matched with the project's research focus. Proposals must detail recruitment, selection, and placement plans, especially as they relate to involvement of women, minorities, the physically disabled, and teachers from resource-poor school districts. Lack of financial resources should not prevent participation of any eligible teacher and proposals must include a plan for

[5] Projects resulting from these awards represent a reorientation of the former Young Scholars (YS) program activities and are meant to provide research experiences for high-potential and/or high-ability students and their teachers.

providing necessary support (e.g., travel, room, and board) for those with limited resources. While not essential to project design, consideration should be given to successive, multi-year participation by teachers. A clear rationale for such a project design should be provided.

— ***Duration.*** Projects are expected to last from three-to-five years.

— ***Activities.*** Participants must engage in meaningful R&D summer activities for a minimum of six weeks that are designed to broaden and deepen scientific and technological knowledge. Activities must clearly relate to well-articulated goals and objectives, as well as include mechanisms for translating research experiences to the classroom (e.g., development of appropriate pedagogical techniques, laboratory experiments) and ensuring the accuracy, effectiveness, and ease of transportability of any laboratory activities and related materials to the school environment. Proposals should clearly describe provisions for meaningful academic-year follow-up and continued dialogue among participants.

— ***Evaluation.*** Proposals should clearly describe formative and summative evaluation plans. Formative evaluation should provide a strategy for strengthening the project through continual feedback from participants, staff, and others. Summative evaluation should include data on the project's success in enhancing participants' disciplinary knowledge, instructional skills, classroom practice, and attitude toward science and technology, as well as a list of participants by name, address, and relevant demographic characteristics. Summative evaluation results must not be purely anecdotal in nature.

— ***Budget.*** Proposals may request no more than $400,000 per year, the maximum being determined by multiplying the number of participating teachers in a given year by $5,000. NSF funds may be applied, in part, to supplement participant salaries, but the majority should be used to support translation of research experiences to the classroom, follow-up, and project evaluation.

— ***Cost-sharing/Co-Funding.*** Participating organizations are expected to provide substantial cost-sharing. Only items allowable under the applicable cost principles, if charged to the project, can be included as cost-sharing. For example, cost-sharing may take the form of participant salaries; staff release time to work with teachers as mentors during project and follow-up activities; donation of relevant materials, supplies, and equipment for implementing related classroom activities in participants' schools; and room and board for participants. For further information on cost-sharing see section, *"Preparation and Submission of Full Proposals."*

Federal laboratories or facilities are expected to join NSF as full partners in co-funding the project. Both cost-sharing and co-funding commitments will be considered in proposal evaluation and will be a condition of any resulting award. The proposal must clearly identify the amount and source of cost-sharing and co-funding to allow NSF to determine its impact on the proposed project.

— ***Institutionalization.*** NSF seeks to support development of effective models that will be institutionalized by the submitting organization over time. Plans for ensuring continuation of the project after NSF support ceases must be clearly described in the proposal.

b. ***Research Experiences for Teachers and Students Projects***—TE anticipates supporting up to six projects, targeted at middle- and secondary-school grade levels, that demonstrate a range of innovative and cost-effective approaches for engaging teachers and students in meaningful SMT research experiences. Participating teacher/student teams (generally from the same school) are expected to work in small groups with researchers and technologists in settings that range from research laboratories to field sites. Research experiences should lead to in-depth mastery of scientific and mathematical concepts and development of measurement and analytic skills. Teacher/student teams, working with researchers during the summer and in subsequent follow-up activities, are expected to translate the research investigations into meaningful classroom experiences. Two types of research participation projects are appropriate for funding consideration:

1) ***Research Apprenticeships for Teacher/Student Teams***—Teachers and students participate directly in a research project conducted by scientists, mathematicians, and/or technologists. Apprenticeships would typically involve working at the research site for a period of at least four-to-six weeks during the summer and include follow-up activities during the school year.

2) ***Research, Large-scale Data Collection, and Analysis for Teachers and Students***—Certain research projects lend themselves to large-scale data collection and/or implementation of research experiences that can be integrated into school curricula. TE will support projects that forge partnerships between practicing researchers and teacher/student participants through four-to-six week summer (or equivalent, intensive academic year) experiences and follow-up activities, with the expectation that participants transport these research activities back to whole schools or classrooms. School-based activities should include gathering, analyzing, and communicating data derived from natural phenomena, museums, or on-line databases. Proposals must identify the focus of study, hypotheses and issues, data collection protocols, and data analysis techniques. Projects should build a research community, bringing together teams of teachers and students to report research findings and/or use electronic communications to continue the dialogue among researcher, teacher, and students in disparate geographic locations.

Characteristics of Research Experience for Teachers and Student Projects—Unlike the *"Research Experiences for Teachers*

Projects" described above, projects that involve teachers and students are expected to be two-to-three years in duration with a maximum annual funding level of $250,000. In addition to the criteria described above, proposals should describe: (1) recruitment strategies for selection of student and teacher participants (at a ratio not to exceed 3:1); (2) selection procedures to ensure participation of high-ability and/or high-potential students in summer research activities; (3) relevance of the planned research to school curricula and demonstrated commitments by school administrators to provide resources for implementing related instructional classroom activities; (4) contents of scientific ethics and career awareness sessions; and, (5) an evaluation strategy for demonstrating the value-added to the SMT education of teachers and students and for identifying factors that lead to the project's effectiveness.

4. REPLICATION AND SCALE-UP PROJECTS

The TE program seeks to broaden its impact by capitalizing on its investment in successful models for in-service training which are consistent with current guidelines. The program especially seeks to support opportunities for cost-effective replication of such projects in new locations or for new target populations and/or to expand projects that have been proven effective in empowering teachers. In both cases, evidence must be provided to demonstrate (1) success of the previous project in improving both the classroom instruction of participating teachers and the achievement of their students (such evidence must not be purely anecdotal in nature) and (2) the potential of the design for meeting the needs of a new or expanded environment, including documentation of those factors that have been critical to its success. In addition, the proposed project must incorporate assurances that necessary school, district, and community support has been secured for project implementation and for sustaining its impact after NSF support terminates.

5. PROFESSIONAL DEVELOPMENT MATERIALS PROJECTS

Major reform efforts in SMT education have increased the need for professional development materials that enhance teachers' understanding, adoption, and implementation of effective, standards-based instruction which utilizes state-of-the-art student materials, assessment strategies, and educational technologies. The TE program, therefore, supports development of the curricula and training materials for pre-K-12 teachers and instructional leaders of science, mathematics, and technology.

Projects may range from the creation of new teacher enhancement materials/curricula to the upgrading of existing ones that respond to innovations in student curricula and instruction; from development of comprehensive teacher enhancement curricula to a few modules for focused content or instructional topics; from focus on a single subject to integration of several disciplines; and from supporting specific comprehensive materials to providing generic teacher enhancement for targeted content and pedagogy.

Project Characteristics. Proposed professional development materials/ curricula are expected to exhibit the following design characteristics:

- have the potential to be national in scope and/or significance;
- reflect national standards and state frameworks (where relevant) that guide content, instruction, and assessment;
- be grounded in the most recent advances in research in teaching and learning;
- recognize the importance of imagination and design skills in developing materials which stimulate interest and understanding,
- actively involve key individuals who have strong disciplinary expertise in science, mathematics, and technology, as well as in research and practice on teaching and learning;
- incorporate educational technologies and telecommunications as vehicles for creating new, more effective teaching strategies;
- provide for pilot and field testing of teacher materials, with personnel and in circumstances representative of the target clientele, as part of on-going project evaluation efforts and the revision process; and,
- include plans for the publication and wide distribution of results and products.

6. PROFESSIONAL SUPPORT FOR THE TEACHING WORKFORCE PROJECTS

To meet national standards for content, teaching, and assessment in science and mathematics education, teachers must continue to learn throughout their careers not only by participating in formal education, but also by engaging in ongoing interactions with their peers, teacher educators, scientists, mathematicians, engineers, and technologists, the informal science community, and the private sector. Teachers need support in their efforts to build and sustain a community of colleagues with shared interests, as well as access to information resources regardless of their location. The TE program will support a small number of projects that provide such opportunities in the following areas:

a) ***Educational Technologies*****—**Educational technologies (e.g., electronic mail, bulletin boards, homepages, electronic conferencing) are becoming commonplace and essential to projects whose effectiveness depends on connecting participants with common interests, resources, or needs. TE seeks to support projects that find innovative ways to utilize educational technologies in providing teachers with the capabilities and support needed to go beyond the typical in-service course. Such projects should work (1) to create a culture of learning where teachers can share ideas, draw freely on the expertise of their colleagues, and gain access to current information, thinking, and discussions about teaching practice and content; (2) to help teachers individualize instruction

through the use of modeling and other pedagogical strategies that are made available through advances in technology; and (3) to extend opportunities and resources to isolated schools and teachers through telecommunications.

Of particular interest are projects that significantly reduce cost yet increase the access to and variety of in-service experiences available through the use of networking, distance learning, and two-way video technologies. Such projects should support teachers in their continual learning and involvement in SMT while preparing them to use technology in their own instruction.

TE will support a few projects that (1) extend electronic networking, information access, and two-way communications to isolated communities in order to support cooperation, collegiality, and the development of a professional community of SMT educators; (2) develop and implement new technologies that provide in-service and ongoing support for the dissemination and adoption of IMD projects; and, (3) extend the model of in-service allowing teachers to contribute to their field or adopt roles where they have a lifelong involvement in their discipline.

b) ***Conferences, Symposia, and Workshops*****—**TE will support opportunities for education and disciplinary experts to explore recent research, instructional materials, new directions, and technologies for the improvement of SMT education.

SPECIAL CONSIDERATIONS FOR THE TE PROGRAM

Budget Items Affecting Participants. The policies outlined below apply to allowable participant expenses within a project. No indirect costs can be applied against these budget categories.

- ***Participant Stipends*****—**A direct stipend of up to $60 per day, prorated for partial days, is strongly encouraged and allowable from NSF funds. The total stipend may exceed these amounts if supplemented from other sources. Teachers employed as staff should be included as senior personnel and not under participant support.
- ***Costs for Substitute Teachers*****—**The cost of hiring substitute teachers is allowable under the following conditions: (1) if it is necessary to the project's administration and (2) if it can be certified that the substitute teachers are directly replacing teachers participating in the NSF-funded project for the time they are working on the project. Substitute teachers are to be paid in accordance with established school district policies and in lieu of paying the teachers participating in the project. Records must be maintained by the accounting office on the hiring of substitutes and their relationship to the project.
- ***Participant Travel*****—**In residential programs, allowable costs for participant travel may include only one round-trip to and from the location of the institution conducting the program and the participant's home. Those participants who commute may be reimbursed for actual travel at approved rates.
- ***Subsistence*****—**Costs for participant room and board may be requested.
- ***Other Support Costs*****—**Tuition fees may be requested from NSF or from participating teachers only if *no* NSF funds are used to support project administration, instruction, or indirect costs. Also, if NSF funds are requested for any of the three items listed, tuition waivers may not be counted as institutional cost-sharing for the project. Indirect costs are not allowed on participant support costs.

Equipment Purchase. In general, funds should not be requested to purchase equipment. Organizations conducting instructional activities are expected to provide laboratory, computing, and other equipment for use by staff and participants. The purchase and maintenance of equipment for use by participants and their students in schools are the responsibility of state and local agencies.

Cost-Sharing. TE projects require cost-sharing (see special considerations for "Local Systemic Change" and "Education through Research Experience" projects). Proposed cost-sharing is considered in evaluating proposals and will be a condition of any resulting award. Typical cost-sharing amounts are 20-30 percent of the NSF award amount and over 100 percent for "Local Systemic Change" projects. Proposals must document the total estimated amount of cost-share, including the expected contribution made from various sources. Major budget item amounts should be given for total costs, the NSF request, and cost-sharing by individual sources. For further details, see section *Preparation and Submission of Proposals,"* page 31.

Annual Reports. Annual reports are required for all multi-year awards. In addition to the requirements for annual reports described in the section, *Announcement and Administration of Awards"* page 31, TE annual reports must provide participant information, as well as an updated TE data form. Reports must include findings from evaluation activities; completed summative evaluation reports should be included. To ensure uniform reporting, LSC projects will be provided a reporting framework; continuation of funding also depends on submission of relevant evaluation data for the mandatory standardized evaluation. PI's will receive complete instructions after an award has been made.

Final Project Reports. Submission of a final report (98A) is required of all projects; see later section on "*Announcement and Administration of Awards."* As appropriate, all TE projects require submission of —

- demographic (e.g., gender, race/ethnic composition, physically disabled) information on participants and their schools;
- a participant list complete with addresses, school affiliations, subject expertise, and grade levels taught;
- a copy of the Data Sheet with all correct information as a result of completion of the project; and,
- information on summative evaluation efforts, including evaluator reports, as available. *Local Systemic Change*

(LSC) projects, as part of the standardized evaluation, must report on professional development activities; teacher involvement; teacher knowledge, attitudes, and beliefs; classroom implementation; project sustainability; and support for reform.

Projects that produce professional development materials for teachers are required to submit a copy of all materials with their final report.

PROPOSAL REQUIREMENTS

Preliminary Proposals. See *"Preparation and Submission of Proposals,"* page 31, for general submission requirements. Preliminary proposals should be received as early as possible—but postmarked no later than April 1st; the NSF response will be returned within ten weeks of receipt by the program.

The preliminary proposal must include a 100-word abstract that clearly summarizes major features of the project. The proposal should describe (1) project objectives, especially as they relate to TE program goals; (2) needs of the teacher population; (3) work plan; (4) project strengths in terms of content, available resources, partnerships, and an overall plan of action; (5) relevant expertise of key personnel; (6) plans for evaluation and dissemination; (7) total budget by major category (including other potential sources of support); and, (8) a timeline for major activities and/or deliverables.

Full Proposals. For further information, see section, "*Preparation and Submission of Proposals.*" Full proposals must strictly adhere to the page limitation and formatting requirements, but appendices may be used to provide information relevant to the project. Appendix material should be clearly referenced in the proposal. Please note that reviewers are not required to read appendices. TE may request set(s) of instructional materials for panel review.

Special Categories of Full Proposals. TE also accepts the following categories of proposals: planning grants, conference grants, and Small Grants for Exploratory Research (SGER). See section, "*Preparation and Submission of Proposals,"* for further information.

- ***Planning Grants***—TE planning grants typically support individuals and/or organizations that (1) have not received prior TE funding and may need external sources of expertise in the design and implementation of a project or (2) must develop complex regional or national collaborations for which local funds could not reasonably be applied. Under no circumstances are such grants intended to be mini-projects. Systemic initiative projects (e.g., SSI, USI, RSI) are ineligible for planning grants. The planning proposal should be based on a comprehensive self-study which clearly demonstrates need. Funds may ***not*** be requested to support proposal writing or participant costs.

  Where appropriate, organizations should develop a vision of goals of a larger project; form necessary partnerships with stakeholders; and develop strategies for bringing outside resources and expertise into the planning process. Planning grant proposals should describe: (1) names, roles, and relevant expertise of planning team members; (2) results of the self-study, identifying needs; (3) a list of names and roles of experts that may be used; (4) a list of resources (e.g., TE projects, schools, other resources) that the planning team will draw upon; and, (5) a description of any instructional materials to be used.

ADVANCED TECHNOLOGICAL EDUCATION

Target Date for Proposals

Full—*October 21, 1997;* **Preliminary, No Later Than—***April 29, 1997*

Telephone: 703-306-1620/1668

GENERAL PROGRAM DESCRIPTION

Purpose. Ensuring internationally competitive manufacturing and other business enterprises, protection of the environment, effective development and use of new technologies, and other high technology activities requires well-educated science and engineering technicians. It has become increasingly apparent that the quality of this high-technology workforce depends on strong and innovative science, technology, engineering, and mathematics education at associate degree granting institutions. Such education should creatively serve first-time students, returning students, and workers seeking new career opportunities or new skills in a changing economy. To be effective, technological education programs require partnerships among two- and four-year colleges, universities, secondary schools, business, government, and industry.

The Advanced Technological Education (ATE) program promotes improvement in technician education delivered at the undergraduate and secondary school levels. The program expects all projects to include major involvement of two-year colleges. Focused on both national and regional levels, it supports curriculum development and program improvement for technicians being educated for the high performance workplace of advanced technologies. Curriculum development encompasses the design and implementation of new curricula, courses, laboratories, and instructional materials. Program improvement encompasses faculty and teacher development, student academic support, and formal cooperative arrangements among institutions and other partners. ATE projects result in major improvements in advanced technological education, serve as models for other institutions, assure that students acquire strong backgrounds in mathematics and science, and yield nationally-usable educational products. All projects must have a vision for technician education which is used to guide project development.

The program is managed jointly by the Division of Undergraduate Education (DUE) and the Division of Elementary, Secondary, and Informal Education (ESIE).

Eligibility requirements under the program are as follows:

- ***Eligible Programs*****—**For purposes of this program, technician education is generally considered to be the occupation-driven education of persons who will use complex technologies. ATE programs focus on strategic advanced-technology fields and offer education and/or work experiences that are based on scientific, mathematical, and engineering principles. ATE-supported fields in engineering technology include, but are not limited to, aeronautical, architectural, biomedical, chemical, civil, communications, computer, electrical and electronic, industrial, manufacturing, materials, mechanical, marine, nuclear, systems, and telecommunications. In the area of science technology, supported fields include, but are not limited to, agriculture, biotechnology, chemical, environmental, hazardous waste, marine science, and optics. Technicians in these fields enhance productivity in manufacturing, telecommunications, transportation, and other commercial activities important to national economic and security interests. Students enrolled in ATE programs at two-year colleges typically earn an associate degree in engineering technology or science technology qualifying them for employment or transfer to a four-year institution.

  ATE will support development of science, mathematics and technology courses in both core and advanced technology areas. The disciplinary emphasis is predicated on the expectation that all ATE programs have a strong core of courses in science and mathematics to serve as prerequisites and co-requisites for specialized technology courses. ATE will also support development of advanced science and engineering technology courses that assume students have mastered such skills and principles. Course development is expected to be a cooperative effort among faculty and appropriate industry staff (e.g., technicians, research staff) in mathematics, science, engineering, and technical fields.

- ***Eligible Institutions*****—**Proposals are invited from two-year colleges, other associate degree granting institutions, two-year college systems, and consortia of two-year colleges. In addition, proposals are welcomed from consortia of other appropriate organizations and institutions (e.g., four-year colleges and universities, secondary schools, professional societies, and non-profit, educational research and development groups) that include two-year colleges in leadership roles. Proposals from a formal consortium should be submitted by the consortium; proposals from an informal consortium should be submitted by one member of the consortium.

  Eligible Costs**—**ATE will support new design or development costs. NSF funds may not be used to support expenditures that would normally be undertaken in the absence of an award.

CATEGORIES OF ATE PROJECTS

In FY 1998, ATE expects to support the following three categories of projects: (1) projects which focus on one or more

aspects of advanced technological education, i.e., curriculum or instructional materials development, faculty or teacher preparation and enhancement, technical experiences for students including internships and cooperative education, or laboratory development; (2) up to five new Centers of Excellence in Advanced Technological Education that provide systems-based approaches to technological education (note: the number and distribution of Centers and projects depends on availability of funds and quality of proposals received); and, (3) conferences, workshops, symposia, design and planning projects, studies, and other special projects that will lead to better understanding and promotion of issues in advanced technological education.

1. PROJECTS IN ADVANCED TECHNOLOGICAL EDUCATION

Project Development. ATE focuses on improving educational opportunities for potential science and engineering technicians. Centers are expected to be comprehensive in scope. Other supported projects may focus more narrowly on curriculum or instructional materials development, faculty or teacher enhancement, faculty or teacher preparation, technical and research experiences for students including internships and cooperative education, or laboratory development. They should, nonetheless, be placed within the context of a more comprehensive program. Because of the nature of ATE programs, where appropriate, projects should build on alliances of associate degree granting institutions with four-year colleges and universities, secondary schools, business, industry, and government. Students and parents must also be made aware of the opportunities and rewards for careers as technicians and the educational requirements necessary to pursue such careers. Projects that cut across the boundaries listed below are especially encouraged.

a. Curriculum and Instructional Materials Projects. ATE supports model projects that demonstrate a vision to improve the quality of courses and curricula in the basic mathematics, science, and engineering core underlying programs in advanced technological education, as well as more specialized science and engineering technology courses. Its activities affect the learning environment, content, and experience of instruction. Technological education is field dependent and driven by applications. There should be a match between occupational requirements and what students are taught. The education component should provide understanding to make the technician more insightful about the work environment and more flexible about receiving additional training which may be job and/or skill related.

ATE seeks projects that envision major changes in technician education and that result in products such as textbooks, laboratory experiments and manuals, software, videos, CD-ROMs, and other educational products. Products are expected to be widely disseminated through publishers, seminars, workshops, electronic networks, and other appropriate means including conference presentations and journal articles. Projects may range from substantial revision of existing materials to creation of entirely new ones; from a few modules at a single instructional level to comprehensive curricula for multiple years; and from a single subject to integration of several disciplines. Projects must produce major changes and significant improvement beyond the recipient institution and produce materials used nationally. Curriculum projects are especially sought that integrate mathematics, science, and technology; are developed by teams of educators, scientists, and industry participants; and implement the national mathematics, science, and industry standards in a technological context. Curriculum projects that prepare future teachers and faculty for advanced technological programs are also encouraged.

A variety of projects are encouraged. Requests normally range from $50,000 to $500,000 per year and for one to three years duration depending on complexity.

b. Teacher and Faculty Development Projects. Faculty and teachers are key elements in advanced technological education. It is critical that they have a sound disciplinary background with knowledge of state-of-the-art developments and techniques in their fields; be intellectually vigorous and excited about their disciplines; employ modern teaching practices; and regard teaching as an important and rewarding activity. To this end, ATE seeks to enhance both the disciplinary capabilities and teaching skills of faculty and teachers, as well as to provide support to maintain their currency and vitality.

Successful projects emphasize content, pedagogy, development and exercise of leadership skills, and opportunities for continuing professional growth. Faculty and teachers also need to be familiar with new instrumentation and the opportunity to evaluate its suitability for instructional use. They need opportunities to synthesize knowledge that cuts across their own and other disciplines. Finally, they also need opportunities to interact intensively with experts in the field and with colleagues who are practicing scientists, technicians, engineers, and mathematicians, both during the course of the project, and in a continuing way after the project.

Typical projects for teacher and faculty enhancement would include conferences, seminars, short courses, industrial internships, institutes, workshops, or a series of such activities. Sessions may vary in length from a few days to several weeks. It is expected that activities would usually be conducted in the summer with follow-up activities during the academic year. To affect long-term change, teacher and faculty enhancement projects normally span at least two academic years.

In the area of teacher enhancement at the secondary level, ATE will fund four categories of projects described for the TE program earlier in these *Guidelines*, i.e., *Leadership, Teacher and Student Development through Research Experiences, Professional Development Materials, and Professional Support for the Teaching Workforce.* Note *Leadership* projects should offer at least three weeks of intensive instruction each summer with intensive follow-up or the equivalent. Projects focused on teachers should provide major support for class-

room and school change, for implementing advanced technological education curricula, as well as for improving the integration of mathematics and science in support of technological education. Projects in which two-year college faculty work with four-year college or university faculty and/or secondary school teachers are encouraged, as are those which bring together faculty and teachers from different disciplines.

Instructional materials projects to prepare pre-service teachers and faculty for careers in technological education are also sought. Programs which are collaborations between two-year colleges and four-year colleges and universities are particularly desirable. Involvement of science, mathematics, engineering, technology, and education faculty and secondary school teachers in curriculum design and program implementation is encouraged.

Teacher and faculty preparation and enhancement projects will normally range from $25,000 to $500,000 per year, with a duration of one-to-three years depending on the complexity and length of the activities, the number of teachers and faculty involved, and the follow-up support provided.

c. Technical and Research Experiences for Students Projects. Technical experiences for students should provide high-potential students from either secondary schools or two-year colleges with a broad perspective of technical fields and introduce them to an intellectually stimulating environment centered on genuine technical experiences. Participants interact on a regular basis with scientists, engineers, and technicians and with peers who have an interest and curiosity similar to their own. Successful projects provide potential technicians opportunities to participate in formulating problems and questions, designing appropriate models, using technological tools, and performing tasks related to their field.

Through participation in technical experiences, it is expected that students will:

- gain greater knowledge of, and exposure to, science, mathematics, engineering, and technology;
- obtain information about, and develop interest in, careers as science and engineering technicians;
- become aware of the academic preparation necessary for such careers;
- become acquainted with the environment of two-year colleges as well as business, industry, government laboratories, research organizations, and other academic institutions; and
- gain increased confidence in their ability in technical areas.

Projects may consist of any combination of activities involving instruction, problem solving, research, design and creation of products. Proposers provide a balance of classroom, laboratory, industrial, and field experiences. While some activities may be individualized, project activities should stress group interactions that foster collaborations among peers and provide substantive feedback.

d. Laboratory Development Projects. Laboratory or field experiences with suitable modern equipment are crucial elements of advanced technological education, especially at the two-year college level. ATE will support projects to develop innovative methods for using laboratory exercises that improve student understanding of basic principles and for using modern instrumentation, new technologies, or applications of instruments that extend the instructional capability of the equipment. ATE also encourages establishment of equipment-sharing through consortia or Centers.

Because ATE focuses on improving the quality of technological education through laboratory improvement, projects based primarily on financial need or replacement of equipment at the same level of capability are not appropriate.

Equipment funds must be matched by non-federal dollars equal to, or greater than, funds requested from NSF. The maximum NSF request for equipment for the life of the project is normally $100,000 or 10% of the total NSF budget request whichever is larger.

2. NATIONAL/REGIONAL CENTERS OF EXCELLENCE FOR ADVANCED TECHNOLOGICAL EDUCATION

National/Regional Centers of Excellence are comprehensive projects that serve as models and clearinghouses for the benefit of both colleges and secondary schools. A Center must have a well-formulated underlying philosophy; a vision for technological education for the future; and a well-defined plan to reach that vision. Model curricula, instructional materials, and teaching methods will be developed at and through these Centers and then disseminated through publishers, seminars, workshops, publications, electronic networks, and other appropriate means. Centers may vary in size, complexity, disciplinary coverage, and extent of the region served. It is expected that Centers will involve active participation in the educational process by both academia and the private and public sectors served by the educational system. Centers are cooperative efforts among two-year colleges, four-year colleges and universities, secondary schools, industry, business, and government and must involve two-year colleges in leadership roles.

Sources of Support. Center proposals should involve a three-pronged alliance of support from:

- ***NSF*—**either for curriculum development (e.g., core courses and laboratories in science, mathematics, engineering, science technology, and engineering technology) or for program improvement (e.g., faculty and teacher development, formal cooperative arrangements among partners);
- ***Proposing educational institution(s) or consortium*—**for other laboratory-driven experiences, student services, and other courses such as technical writing to support the programs;
- ***Local business, industry, and government agencies and laboratories*—**for apprenticeships, cooperative educational

experiences, and internships for students, faculty enhancement, loan of technical professionals to teach, and other modes of active cooperation in the Center.

Project Elements. It is anticipated that the proposal for a Center will include, but not be limited to, most of the following elements:

- ***Curriculum Development***
  - — curriculum improvement in the basic mathematics, science, and engineering core underlying the proposed program;
  - — curriculum improvement in science technology and engineering technology courses with the expectation that students have strong mathematics and science backgrounds;
  - — assessment of student learning;
  - — a product-oriented approach aimed at producing laboratory experiments and manuals, textbooks, software, videos, CD-ROMs, and other educational materials of potential widespread benefit, as well as conference presentations and journal articles;
  - — coordination among technical specialties and other course areas;
  - — student experiences with appropriate equipment;
  - — collaboration with secondary schools and technical education professionals in the design of curricula and instructional materials that provide a foundation for technician education;
  - — instructional approaches that encourage such activities as student writing, oral presentations, group learning experiences, and long term projects;
  - — pedagogical designs that enhance the learning opportunities for women, minorities, and persons with disabilities.

- ***Program Improvement***
  - — preparation and enhancement of college faculty, especially at the two-year level;
  - — preparation and enhancement of secondary school teachers congruent with the TE program (see TE section of these *Guidelines*);
  - — use of modern instructional technologies in classrooms and laboratories;
  - — recruitment, retention, and placement of students, especially those groups underrepresented in careers in science, mathematics, engineering, and technology;
  - — improved guidance for students with diverse educational and work experiences entering the programs—both for students entering from high school programs and for those returning with a wide variety of work and educational experiences;
  - — alliances with local business, industry, and government including (1) internships, cooperative educational experiences, and apprentice opportunities for students and/or (2) faculty enhancement, exchange, and loan programs;
  - — articulation of courses and programs between secondary schools, two-year colleges and four-year colleges and universities;
  - — innovative partnerships for design of curricular and instructional materials and for their dissemination through national consortia, associations, and publishers;
  - — project evaluation to include, as appropriate, alignment with national standards;
  - — professionalization of technician careers, including accreditation, use of voluntary industry standards, and certification;
  - — electronic networking of partners for exchange of information and materials, including file transfers;
  - — collaborative arrangements with secondary schools; and,
  - — awareness of students and their parents about opportunities in technical careers.

Funding and Duration of Centers. National/Regional Centers of Excellence for Advanced Technological Education are expected to be comprehensive projects involving curriculum development and program improvement as described above. In FY 1998, NSF anticipates making up to five new awards for Centers depending on availability of funds. Awards will be made for up to $1 million per year for a duration of three-to-five years.

3. WORKSHOPS, CONFERENCES, SEMINARS, STUDIES, AND OTHER SPECIAL PROJECTS

ATE expects to support a few special projects such as conferences, symposia, studies, design and planning projects, and other activities that will lead to a better understanding of issues in advanced technological education.

Requests should normally be made at least nine months in advance of the date of the scheduled activity. Individuals or groups wishing to submit such a request should contact an ATE Program Director in DUE at (703) 306-1668 or in ESIE at (703) 306-1620, as appropriate, before preparing a two- to three-page preliminary proposal. Following an initial discussion, a preliminary proposal which includes a project outline, description of personnel involved, and approximate budget should be sent to the appropriate ATE Program Director. NSF staff will review these preliminary proposals and encourage selected formal proposals.

Formal proposals for such activities should include: (1) a summary indicating the objectives of the project; (2) a statement of the need; (3) names and qualifications of key personnel organizing and leading the activity including vitae of Principal Investigators; (4) lists of participants to be invited or other persons to be involved in the project; (5) information on probable dates of workshops or meetings or duration of other type projects; (6) a budget which details the requested NSF contribution and support requested or available from other sources; (7) products to be disseminated; and (8) evaluation of impact of activity. Because proceedings are normally published, requests for support can also include publication costs.

Preliminary proposals and formal proposals for these special projects should be sent directly to an ATE Program Director at the

National Science Foundation, Division of Undergraduate Education - Room 835, 4201 Wilson Boulevard, Arlington, VA 22230.

PREPARATION AND SUBMISSION OF PRELIMINARY AND FULL PROPOSALS

The deadline for preliminary proposals for Centers and projects not previously submitted to the ATE program is April 29, 1997. Formal proposals for projects and Centers are due October 21, 1997.

Preliminary Proposals. Except as identified above, submit seven copies, postmarked no later than April 29, 1997, to the address indicated on page 31. Preliminary proposals will be reviewed by NSF staff and other selected outside reviewers using review criteria listed below. A subset of applicants will be encouraged to submit formal proposals. The time between the deadline for submission of preliminary proposals and the reply from NSF will be approximately ten weeks. Additional details concerning preliminary proposals (see section, *"Preparation and Submission of Proposals"* in these *Guidelines)* should be carefully reviewed and followed in preparing and submitting a preliminary proposal.

The preliminary proposal should express the conceptual design of the full proposal. Sufficient detail must be provided so that reviewers can evaluate the potential success of the project. The narrative of a preliminary proposal to ATE must address the following:

- ***Project Goal***—Briefly describe the need for the project and the current advances upon which it is based. Be specific concerning what is to be accomplished and the target audience.
- ***Strategies***—Describe the means to be used for accomplishing the goal. Highlight aspects that you consider innovative and most likely to produce change on a national scale.
- ***Personnel***—Identify the project leaders; briefly describe their roles, qualifications, and credentials to undertake specific
- ***Evaluation and Dissemination***—Describe the criteria to be used to determine project success. Outline plans for evaluating and disseminating products and/or strategies.
- ***Partnerships***—Identify and briefly describe the roles of institutions and their alliances that will participate in the full project. Demonstrate that extent of existing partnerships.
- ***Connections***—Identify other NSF projects with whom you will be interacting and describe the nature of the interaction. And,
- ***Strategies to Accommodate Diversity***—Describe plans to increase the diversity within the workforce and to increase effective dialogue among faculty, teachers, industrial participants, and others. Outline specific ways in which these plans will be accomplished.

Full Proposals for Centers and Projects. General information on proposal preparation is included in the section, *"Preparation and Submission of Proposals."* Page limits given here apply. Proposers may wish to consult the publication***, GPG*** **(NSF 95-27**), for additional information. Please indicate the preliminary proposal number that was assigned to your preliminary proposal.

REVIEW CRITERIA

NSF grants are awarded on a competitive basis. In selecting proposals to be supported in the ATE program, NSF is assisted by reviewers who are mathematicians, scientists, engineers, technicians and technologists, and educators in related disciplines. Reviewers are selected from two and four-year colleges and universities, secondary schools, industry, and professional societies.

NSF reviews proposals on the basis of four general criteria outlined in the ***GPG*** **(NSF 95-27).** The criteria, as they relate to the ATE program, are outlined below.

- **Performance Competence.** This criterion relates to the capability of the investigator(s), the technical soundness of the proposed approach, the adequacy of the institutional resources available, the proposer's recent experiences in technical education or other related educational areas, or the proposer's' experiences in the workplace or research that is relevant to what is proposed. Typical questions raised in the review process include:
  - — Is the proposal supported by the involvement of capable faculty (and, where appropriate, practicing scientists, mathematicians, engineers, technicians, teachers, and student assistants), adequate facilities and resources; does it have institutional and departmental commitment?
  - — Does the proposal show an awareness of current pedagogical issues, the extent of the problems, what others have done, and relevant literature in the technological field of the project?
- **Intrinsic Merit.** This criterion relates to the quality, currency, and significance of the scientific/technical content and related instructional activity of the project within the context of technician education. Typical questions raised in the review process include:
  - — Does the project address a major challenge facing technician education?
  - — Does the project address the current and future needs of industry for technicians?
  - — Are the goals and objectives, as well as the plans and procedures for achieving them, innovative, well-developed, worthwhile, and realistic?
  - — Are the plans for evaluating progress and results of project adequate?
  - — Are the plans for assessing student learning adequate?
  - — Does the proposal indicate appropriate experience with using new teaching tools and educational technologies?
  - — What principles of science, mathematics, engineering, or technology will be taught in the laboratory; is requested equipment the most suitable for this purpose?

— Does the project enhance the current status of technician education?

- **Utility or Relevance of the Project.** This criterion relates to the appropriateness and impact of the project at the proposing institution, groups of institutions, or system, as well as in the current and future workplace. Typical questions raised in the review process include:
  - — Does project design take into consideration the background, preparation, and experience of the target audience?
  - — Are the proposed course, curriculum, faculty or teacher professional development, experiential learning, or laboratory activities integrated into the institution's or system's academic program(s)?
  - — Are project results likely to be useful at similar institutions?
  - — What is the potential for the project to produce widely used products which can be disseminated through commercial or other channels?
  - — How applicable is the project to the needs of the current and future workplace?

- **Effect on the Infrastructure of Science and Engineering Technician Education.** This criterion relates to the potential of the proposed project to contribute to better understanding or improvement of the quality, distribution, or effectiveness of the nation's technical workforce. Typical questions raised in the review process include:
  - — Are plans for national dissemination of instructional materials and communication of results appropriate and adequate?
  - — Will the project likely result in one or more of the following—(1) delivery of high-quality education to students planning to pursue careers as technicians; (2) increased participation of qualified women, minorities, and persons with disabilities; (3) solid content and pedagogical preparation of faculty and teachers of science and engineering technology and the science, mathematics, and technology core areas which undergird these fields; (4) provision of a foundation for scientific, technological, and workplace literacy; and, (5) development of multi- and interdisciplinary courses and curricula, that are aligned with science and mathematics standards, as appropriate?
  - — Are plans for project evaluation appropriate and adequate?

PREPARATION and SUBMISSION of PROPOSALS

GENERAL INFORMATION

This section provides basic information needed to initiate planning for proposal submission. Detailed NSF guidelines on proposal preparation, submission, evaluation, awards (general information and highlights), declinations, withdrawal, and required forms can be found in ***Grant Proposal Guide (GPG)*** **(NSF 95-27).** Single copies of this publication are available at no cost from the Forms and Publications Unit, National Science Foundation, 4201 Wilson Boulevard, Room P15, Arlington, VA 22230; by telephone: (703) 306-1130; or via electronic-mail: pubs@nsf.gov. These guidelines apply except where specifically modified in this program announcement.

Additional details are contained in the NSF ***Grant Policy Manual*** **(NSF 95-26)**, available electronically through the ***Scientific and Technical Information System (STIS)*** or for purchase at $21.00 from the Superintendent of Documents, Government Printing Office, Washington, DC 20402. The ***Manual*** is not ordinarily needed to prepare a proposal. However, if a submitting organization has never received an NSF award, it is recommended that appropriate administrative officials become familiar with the NSF policies and procedures contained in this ***Manual*** as they apply to most NSF awards. Prior to receipt of an award, such institutions will be required to provide the Division of Grants and Agreements certain organizational, management, and financial information (See Chapter V of the ***Manual***).

PRELIMINARY PROPOSALS

To be eligible for submission, a full proposal to any program within ESIE (with the exception of conference, planning, or Small Grants for Exploratory Research (SGER)) must either be (1) based on a preliminary proposal to that program and subsequent NSF staff response or (2) a revision to a previously declined proposal from that program. Any exception must get prior approval from the relevant program within ESIE. Proposers should refer to descriptions of programs for content requirements and submission deadlines. Preliminary proposals should contain:

- ***Transmittal Letter (ATE submissions must use NSF Cover Page (NSF-1207)).*** Clearly indicate the program to which the proposal is to be submitted, as well as the name and address of the PI to whom reviews should be sent. As appropriate, indicate type of project (e.g., LSC/K-8, LSCM/7-12, IMPL, PARENT), disciplinary focus, and grade level(s). Note: For ATE, *NSF Form 1207* should be signed by the Principal Investigator(s). Other institutional signatures are not necessary.
- ***Project Data (for ATE program only—Form 1295).*** Provide institutional data and an abstract (see below).
- ***Abstract.*** Briefly describe the project and the target audience giving enough information to assign the proposal to reviewers with specific expertise.
- ***Narrative.*** The narrative should not exceed six single spaced pages. Use 2.5 cm margins, a type size of 12-point font or larger, and print on one side of the page only. ***No appendices are allowed; letters of commitment, curriculum documentation, etc. are not appropriate at the preliminary proposal stage.*** Narrative content is described separately for each program; see appropriate sections of these *Guidelines*.
- ***Budget.*** Preliminary proposals to the ISE, IMD, and TE programs should provide an estimated budget for total project cost with information, as appropriate, on salaries, equipment (see program descriptions for allowable equipment requests), participant costs, consultant costs, travel, and other.

  For ATE only, provide an estimated yearly budget separated into general categories for salaries, equipment (equipment funds must be matched by non-federal dollars equal to or greater than funds requested from NSF), supplies, travel, other direct costs, and indirect costs at a Federally negotiated approved rate. A plan for contributions by other partners should be shown, together with an estimate of the amounts to be contributed. It is not necessary to use the NSF budget sheet or to provide budget details.
- ***Vitae.*** Preliminary proposals to the ISE, IMD, and TE programs should provide a brief description of the expertise of key personnel. *For ATE only,* provide a maximum two-page vita for each of the principals involved in the project. The vitae should be complete enough to show the necessary expertise available to conduct the project.

Submission of Preliminary Proposals.

- **Preliminary proposals for *ISE, IMD, TE, Parents, and Implementation*** must be postmarked no later than the date specified by the program in order to be eligible for the next full proposal submission date. Two copies should be sent directly to:

  "Program" Name—[Acronym, i.e., IMD, ISE, TE, PARENT, IMPL]
  National Science Foundation—ESIE/EHR
  4201 Wilson Boulevard — Room 885
  Arlington, VA 22230

- **Preliminary proposals to the ATE program** (except as identified for workshops and other special projects) should be submitted, with seven copies, to:

  Friday Systems Services
  ATTN: EHR/DUE—ATE
  Announcement No. NSF 97-20
  40 West Gude Drive—Suite 100
  Rockville, MD 20850

FULL PROPOSALS

Contents. Full proposals should contain the following information, assembled in the order indicated below. ESIE project data and summary forms are provided in the back of this announcement; standard NSF forms are available in the ***GPG* (NSF 95-27)** and through the World Wide Web at http:\\www.nsf.gov.

***Cover Sheet*—**The cover sheet must contain all requested information. One copy of the cover sheet must carry the original signature of the Principal Investigator (PI), all co-PIs, and the authorized organizational representative. If project funds are requested from another Federal agency or another NSF program, it must be indicated in the upper-right-hand section. If such funds are requested subsequent to proposal submission, a letter should be sent to the relevant program in the ESIE Division, identifying the proposal by its NSF number.

The top left box should identify proposals submitted under special initiatives or program components (e.g., "LSC/K-8" and "LSCM/7-12" for *LSC* projects; "TE" for non-LSC projects; "IMPL" for Implementation projects; "PARENT" for projects on parent involvement).

Project titles help direct proposals to appropriate reviewers and communicate the nature of projects supported with NSF funds to the general public and scientific community. They should include informative key words that indicate, for example, the discipline, grade level (when relevant), target audience, and the nature of the project.

***Project Summary*—**A one-page summary, suitable for publication, should be prepared that presents a self-contained description of the activity that would result if the proposal were funded. It should be written in the third person and include a statement of objectives, methods to be employed, and potential contribution to the advancement of knowledge. It should be informative to other persons working in the same or related fields and, as much as possible, understandable to a scientifically or technically literate lay reader.

***Project Data*—**This information is primarily used to communicate potential project impact and general project characteristics, as well as to direct proposals to appropriate reviewers. If a project summary or abstract is requested, it should contain a clear, concise description of the project indicating the need being addressed, specific goals and objectives, a realistic estimation of potential impact, and target audience.

***Project Narrative (including results from prior NSF support)*—** The narrative presents most of the information that determines whether or not a grant will be awarded. It should be written to respond to criteria that will be used by reviewers in judging the merit of the proposal as described in this document.

If the prospective PI or co-PI(s) received support for related NSF activities within the past five years, a brief description of the project(s) and outcomes must be provided in sufficient detail to enable reviewers to assess the value of results achieved. Past projects should be identified by NSF award number, amount, period of support, title, summary of results, and a list of publications and formal presentations that acknowledge the NSF award (do not submit copies of the latter). Descriptions of results of relevant prior NSF support (see below) should be limited to five (5) pages and must be included as part of the page limitations listed below. PI's must have submitted an NSF Form 98A (Final Report) for any completed NSF-funded project or no new grant may be awarded. Formatting should follow requirements specified in the ***GPG,*** unless otherwise noted in the box which follows. ***Proposals not conforming to requirements will be returned by NSF.***

***Vitae (NSF Form 1362)*—**Biographical information (no more than two pages) must be provided for each person listed as senior personnel on *NSF Form 1030* (Proposal Budget); include career and academic credentials and a mailing address. In addition, the following information should be provided, as appropriate—

- A list of up to ten publications (up to five of which are most relevant to the proposed work and up to five other significant publications); patents, copyrights, or software systems may be substituted for publications. This list may overlap the required list of publications resulting from and citing prior NSF support. No more than ten publications will be submitted to reviewers.
- A list of the names of graduate and undergraduate students with whom the senior personnel have been associated as thesis advisor, and of sponsored postdoctoral scholars over the past five years. Include a summary of the total numbers of graduate and undergraduate students advised and postdoctoral scholars sponsored.
- A list of scientists with whom the senior personnel has had a long-term association and/or has collaborated on a project, book, article, report, or paper within the past four years and the PI's own graduate and postdoctoral advisors. This list assists in identifying potential conflicts-of-interest in merit review.

***Budget (NSF Form 1030) and Budget Justification*—**Proposals must contain a budget for each year of requested support and a cumulative budget for full NSF support. Facsimiles of *NSF Form 1030* may be used, but at no time may substitutions or deletions in budget categories be made. The proposal may request funds under any budget category so long as the item is considered necessary to perform the proposed work and is not precluded by program guidelines or applicable cost principles. All budget requests must be documented and justified. Ordinarily, no funds are made available for equipment or facilities. Estimates of calendar months of activity must be reported for categories of key personnel. Additional information on completing the budget can be found in the ***GPG* (NSF 95-27)**.

***Cost-sharing*—**The TE and ISE programs expect significant cost-sharing; such cost-sharing is considered in the review and ultimate award decisions on proposals. Financial aspects of cost-sharing should be shown in a table that provides details for each

FORMATTING REQUIREMENTS for PROJECT NARRATIVE **(Note:** Proposals not meeting these requirements will not be accepted for review.)	
Double-spaced—Four printed lines per 2.5 cm. **Top, bottom, side margins**—No less than 2.5 cm. **Type size—**Must be clear and legible with no more than 12 characters per 2.5 cm, if using *constant spacing*. no more than an average of 15 characters per 2.5 cm, if using *proportional spacing*. **Pages—**Pages must be numbered sequentially (preferably at the bottom), be of standard size, and conform to standard formatting instructions set in ***GPG* (NSF 95-27*).*** **Copies—**single side of page only.	
Program	**Maximum Number of Pages, by program, by type of proposal ***
Informal Science Education (ISE) **Instructional Materials Development (IMD)** **Teacher Enhancement (TE)** **Parent Involvement in SMT Education** **Implementation and Dissemination**	***Double-spaced Pages (all programs):*** 30 (Full), 20 (Planning), 20 (Conference) ***or*** ***Single-spaced Pages (all programs):*** 15 (Full), 10 (Planning), 10 (Conference) ***Single-spaced Pages (all programs):*** 6 (Preliminary)
Advanced Technological Education (ATE) Centers Projects Preliminary	***Double-spaced Pages (ATE only):*** 40 (Centers) 30 (Projects) 12 (Preliminary) *[or 6 single-spaced]*

* **NOTE:** Page limitations include visual materials (e.g., charts, graphs, maps, photographs, other pictorial presentations).

contributing party (e.g., NSF, School System, University, Total) by major budget category (e.g., salary, materials, stipends, travel, total). Documentation (e.g., letters of commitment) must be included in the proposal; the strength and quality of these letters are a factor in award decisions.

Categories acceptable for cost-sharing must be eligible for NSF funding and may cover items such as personnel, materials, equipment, supplies, and computer services. Categories that are *not* acceptable include: tuition remission (see budget), general-purpose office equipment, rental of rooms, janitorial costs, and/or other similar charges at an institution receiving indirect costs. Only items allowable under the applicable cost principles, if charged to the project, may be included as the grantee's contribution to cost-sharing.

Funds from non-Federal sources may be counted as cost-sharing against only one Federal project. Total non-Federal cost-sharing should be shown on Line M of NSF Form 1030. The level of cost-sharing that is reported on Line M of the final negotiated budget is auditable and its attainment becomes a precondition for future funding increments. Funds from Federal agencies (e.g., Eisenhower Funds of the Education for Economic Security Act) should not be included in Line M of NSF Form 1030, but should be identified separately by source and amount in the budget explanation.

Current and Pending Support (NSF Form 1239)—All current and pending externally-funded support (including that from non-NSF sources) to the PI and co-PI's (if any) must be listed on the form. The proposed project and all other projects or activities requiring a portion of the time of the PI or other senior personnel should be included, even if they receive no salary support from the project. The number of person-months per year to be devoted to the projects must be stated, regardless of source of support. Similar information must be provided for all proposals already submitted or submitted concurrently to other possible sponsors, including NSF. This information is needed to ensure that key personnel have time to carry out the project and that there is no duplication of support.

Appendices—Reviewers are often asked to read and assess a substantial number of competing proposals. For this reason, the proposal description alone should provide sufficient information so that a reviewer unfamiliar with the context of the project can make an informed judgment. In some cases, it may be critical to convey more detailed information to demonstrate levels of competence or expertise; to document commitment of personnel or other resources; to demonstrate the quality of instructional materials; or to provide other relevant information. Such material can be included in appendices which are clearly referenced by the proposal. Presentation of such materials should be thoughtful and concise. Reviewers are not generally required to read appendices.

Proposals for materials for students, teacher professional development, or parents should include examples of proposed materials, and samples of past work, if they exist. Proposals seeking to implement curriculum in *Local Systemic Change* and *Replication* projects (TE program) or *Implementation and Dissemination* projects (TE and IMD programs) must include a complete description of the materials; samples of materials should be sent directly to the program for exhibit to reviewers. Prospective PI's are encouraged to contact NSF Program Officers if they have any questions regarding submission of appendix materials.

ISE proposals that involve exhibit development, film, television, or other media should include diagrams of exhibits, program treatments/scripts, or any other materials which may assist reviewers in understanding the specific plans for the proposed project. Media proposals should also include samples of past work to demonstrate production skills of the proposers. A set of sample materials should be included with **each** copy of the proposal.

Appendices should be clearly labeled, paginated, and identified in the Table of Contents. Appendices should be printed on colored paper, or separated with colored sheets, to make them easily distinguishable from the body of the proposal.

Submission of Full Proposals.

Required materials must be postmarked no later than the program closing date. ESIE programs require—

- one (1) copy sent directly to the program at

  Program Name [Proposal Identification, i.e., IMD, ISE, TE,
  ATE, PARENT, IMPL]
  National Science Foundation—ESIE/EHR
  4201 Wilson Boulevard — Room 885
  Arlington, VA 22230

  Include a transmittal letter identifying the preliminary proposal or declination number on which the proposal is based, the program to which it is being submitted, the title, as well as grade level and disciplinary focus.

- 14 copies **[IMD, ISE, TE, Parent, and Implementation],** including the signed original, sent in a single package to:

  NSF Proposal Processing Unit
  ATTN: EHR/ESIE — [Proposal Identification—see above]
  National Science Foundation — Room P60
  4201 Wilson Boulevard
  Arlington, VA 22230

- 10 copies **[ATE]** including the signed original, sent in a single package to:

  Friday Systems Services
  ATTN: EHR/DUE—ATE
  Announcement No. NSF 97-20
  40 West Gude Drive—Suite 100
  Rockville, MD 20850

The following materials must be included with all proposal submissions:

- One copy of "Supplementary Information on PI's/Project Director" *(NSF Form 1225)*. Do not include a copy of Form 1225 in the body of the proposal, since this would compromise the confidentiality of the information. While providing information requested on *NSF Form 1225* is voluntary, submission of this form is required by NSF and its omission will cause delay in processing the proposal. NSF forms can be found in the ***GPG (NSF 95-27)*** and through the World Wide Web at http:\\www.nsf.gov.

- Two (2) sets of the following extra forms, with each set stapled as a unit:
  - one copy of the Cover Sheet,
  - one copy of the Project Data Form,
  - one copy of the Project Summary,
  - one copy of the Budget, including explanation pages.

The following requirements also must be met:

- All materials submitted to NSF must be contained in a secured package. NSF cannot be responsible for the processing of proposals damaged in transit.
- Each copy of the proposal should be on standard sized paper of regular weight. It should be stapled **only** in the upper left hand corner and should not be bound by means of glue, spirals, wire, clasps, or any other means. All narrative and appendix pages must be numbered. The duplicating process should ensure legibility for at least five years.
- One copy must be signed by the PI, all co-PIs, and the administrative official who has been designated as an Authorized Institutional Representative.

SPECIAL CATEGORIES OF FULL PROPOSALS

[These categories of proposals do not require preliminary proposals.]

Conferences, Symposia, and Workshops. NSF supports conferences, symposia, and workshops to assemble experts for purposes of discussing recent research or education findings, exposing others to new research and education techniques, and developing action plans. Proposals must describe: (1) the rationale for selecting participants and recruiting strategies; (2) the nature of participant involvement and relevance of the conference to their normal professional activities; and (3) the "action plan" being developed for participants and its anticipated impact. Conference proceedings are normally published in professional journals, requests may be made for publication costs. Funding is expected to be no more than $100,000. Note that no indirect costs may be applied to participant support costs. Such proposals must be made at least nine months in advance of the scheduled date; one-year lead time is preferable.

Proposals should include: (1) a summary (one page or less) indicating the objectives of the project and its potential for changing practice; (2) statement of need and a list of topics; (3) names and qualifications of key personnel organizing the activity; (4) lists of participants; (5) information on the location and probable date(s) of the meeting; (6) the method of announcement or invitation; and, (7) estimated total budget, detailing the requested NSF contribution and support requested or available from other sources. For further information, see ***GPG* (NSF 95-27).** These proposals may be submitted at any time and do not require prior submission of a preliminary proposal. Proposals should be transmitted to NSF using the guidelines for full proposals described above.

Planning Grants. Planning grants are generally intended for individuals or groups who have been underrepresented in science or mathematics education activities (e.g. minorities, women, the physically disabled), new performers who do not have the resources to prepare full proposals, or individuals attempting to coordinate the activities of large and complicated systems and/or develop large-scale leadership activities. [See TE section for special restrictions under that program.] Applicants must present a clear description of the planning activities, goals, and methods. Planning grants are subject to external review in all programs except TE. These proposals may be submitted anytime during the year, in the same format as a full proposal although the project description may be less detailed. An original, signed proposal with four copies should be sent directly to the relevant program.

In general, ESIE will support planning grants under the following conditions: (1) they are small-scale or exploratory in nature; (2) the award typically does not exceed $50,000 and no more than a 10-percent indirect cost rate may be requested; (3) the duration does not exceed two years; and, (4) awards are nonrenewable and continued support may be requested only through submission of a full proposal. A final project report is required. Full proposals that result from planning grants require prior submission of a preliminary proposal that may be submitted prior to completion of the planning activity.

Small Grants for Exploratory Research (SGER). Proposals (one copy only) for small-scale, exploratory, high-risk research in the fields normally supported by NSF in both research and education, may be submitted to individual programs. Eligible SGER activities include: (1) preliminary work on untested and novel ideas; (2) ventures into emerging research areas; (3) application of new expertise and new approaches to "established" research topics; (4) research having severe urgency with regard to availability of, or access to data, facilities, or specialized equipment, including quick-response research on natural disasters and similar unanticipated events; or (5) efforts of similar character likely to catalyze rapid and innovative advances.

Project descriptions for SGER proposals should be two to five pages in length and include clear statements as to why the proposed research should be considered particularly exploratory and high risk; the nature and significance of potential impact on the field; and why an SGER grant is suitable for supporting the work. SGER proposals are not subject to external peer review. The budget request is not to exceed $50,000. Project duration will normally be one year, but no more than two years. Renewed funding may only be requested through submission of a non-SGER proposal which will be subject to full merit review. Information about this activity can be obtained from NSF program officers or the current NSF brochure. The box "Small Grant for Exploratory Research" must be checked on the NSF Form 1207.

REVIEW CRITERIA

Grants are awarded on a competitive basis using both panel and ad hoc mail review, as appropriate. Reviewers are selected from among scientists, mathematicians, engineers, technologists; teachers and other educators; and professional and institutional leaders drawn from colleges, universities, schools, research organizations, museums, public service groups, government agencies, industry, professional societies, and media organizations. Special efforts are made to secure reviews from individuals with strong records of achievement in working with special target audiences (e.g., women or minorities) or with specialized expertise (e.g., development of museum exhibits, media production). Award recommendations are made by program staff and reflect reviewer comments, expertise of the program staff, program priorities, and resource availability.

NSF evaluates proposals on the basis of four general criteria outlined in the ***GPG* (NSF 95-27)** which are interpreted in light of the goals and objectives of each program. Proposers should carefully review individual program guidelines for any special review criteria. The four general NSF criteria are:

- **Performance Competence.** Capability of the investigator(s), the technical soundness of the proposed approach, and the adequacy of institutional resources available or proposed.
- **Intrinsic Merit.** Likelihood that the project will lead to new discoveries or fundamental advances within its field or have substantial impact on progress within the field or in other scientific and engineering fields.
- **Utility or Relevance of the Project.** Likelihood that the project can contribute to the achievement of a goal that is extrinsic or in addition to that of the field itself, and thereby serve as the basis for new or improved technology or assist in the solution of societal problems.
- **Effect on Infrastructure of Science or Engineering.** Potential of the proposed project to contribute to better understanding or improvement of the quality of distribution, or effectiveness of the Nation's scientific and engineering research, education, and personnel base and the adequacy of the evaluation plan for ensuring this potential.

The criterion referencing effect on the infrastructure permits evaluation of proposals in terms of their potential for improving the scientific, mathematics, and engineering enterprise and its educational activities. Under this criterion, consideration is given to potential impact on personnel (e.g., women, minorities, and persons with disabilities); institutional and geographic resource distribution; underdeveloped fields; and utilization of interdisciplinary approaches to science, mathematics, and technology education in appropriate areas.

In addition to the above considerations, specific criteria used in evaluating ESIE proposals are:

- **Impact.** The potential for the project to make a significant impact in addressing a major national or regional problem. Potential of the project for significantly strengthening the Nation's literacy and education in science and technology. Adequacy of the evaluation plans for ensuring such impact. Use of a particularly creative approach that might serve as a model for others.
- **Plan.** Likelihood that the project will achieve results, be cost-effective, and be appropriate relative to needs and anticipated impact. The soundness of the approach with respect to disciplinary content and/or instructional methods. Alignment or integration of the project with other major efforts to improve the quality of science, mathematics, or technology education. Reasonableness of evaluation plans. Credibility of the plan for project continuation beyond NSF support. Reasonableness of mechanisms put in place that are expected to result in widespread dissemination of instructional materials, models or other project results.
- **Personnel.** The expertise and background of senior personnel that will ensure success of the project. Assurances that levels of commitment and involvement are commensurate with their anticipated contribution.
- **Products.** Clear description of expected products or outcomes of the project and the likelihood that they will be of high quality. Likelihood that the impact of the project will be broadened through dissemination or replication of products or outcomes in other locations or nationally.
- **Cooperative Relationships.** Reasonableness of working relationships among collaborating parties and clear evidence of the level of collaboration demonstrated in the proposal. Likelihood that the project will facilitate greater interactions among professionals in museums, media, cooperating school systems, universities, and industry. Evidence that long-term relationships are likely to be forged that can supplement and support the quality of science, mathematics, and technology education.
- **Contributions.** Evidence that the proposal includes appropriate contributions (intellectual and/or financial) from the host institution, private sector, state or local educational agencies, colleges and universities, professional societies, and other sources.

ANNOUNCEMENT and ADMINISTRATION of AWARDS

ANNOUNCEMENT

Review and processing of proposals requires approximately six months. Decisions are announced individually through written notices to the institution and to the PI. Before notice is sent, NSF staff can give no information concerning the probability that any particular proposal will be supported or declined. Proposers are strongly urged to refrain from making inquiries. Decisions on awards for individual projects are announced as soon as they are made. Thus, some proposers receive a decision earlier than others. The number of awards made depends on the quality of those received and the availability of funds.

ADMINISTRATION OF GRANTS

Grants awarded as a result of this announcement will be administered in accordance with the terms and conditions of NSF GC-1 (10/95) or FDP-III (7/96), ***Grant General Conditions***. Copies of these documents are available at no cost from the NSF Forms and Publications Unit, National Science Foundation, 4201 Arlington Boulevard, Room P15, Arlington, VA 22230; by telephone, (703) 306-1130; or via electronic-mail: pubs@nsf.gov. More comprehensive information is contained in the ***Grant Policy Manual*** *(NSF 95-26)* for sale through the Superintendent of Documents, Government Printing Office, Washington, DC 20402. NSF publications can also be obtained from the World Wide Web at http://www.nsf.gov.

PRIOR APPROVAL REQUIREMENTS

Prior written authorization from NSF is required for the following: (1) transfer of project effort; (2) changes in objectives or scope; (3) absence or change in PI; (4) a substantial change in PI effort; (5) rearrangements or alterations (construction activities) costing $10,000 or more; (6) establishing relatedness of projects under the direction of collaborating PIs; and (7) reallocation of funds budgeted for participant or trainee support. Decreases in participant support costs require approval of the cognizant Program Officer; all other changes listed above require approval of the cognizant Grants Officer. (See ***Grant General Conditions (GC-1)***). For participants in the Federal Demonstration Project, decreases in participant support costs, as well as changes in objectives, scope, or PI require prior written approval from NSF. (See also ***GPM*** Exhibit III-I which highlights grantee notifications to, and requests for, approval from NSF.)

TRANSFER OF PRINCIPAL INVESTIGATOR

If a PI leaves a project before its completion, the grantee institution has the prerogative to nominate a replacement PI or request that the grant be terminated. Replacement PIs are subject to NSF approval by the cognizant Program Officer named in the grant letter. A written request for the change in PI should include an explanation for the request, the nominee's qualifications, curriculum vitae, and statement of current and pending support, and must be signed both by the nominee and the grantee's Authorized Organizational Representative. Approval is then obtained from the cognizant Grants Officer. The appointment of a new PI is not effective until written approval is received from NSF.

In those cases where a particular PI's participation is integral to a given project and the PI's original and new organizations agree, NSF will arrange a transfer of the grant and assignment of remaining unobligated funds to the PI's new organization (See ***GPM***, Section 312 and ***GPM*** Exhibit III-2 for NSF Form 1263 *"NSF Grant Transfer Request*

GRANT REPORTS

Annual Progress Reports. All multi-year grants require submission of an annual technical progress report to the cognizant NSF Program Officer [see Article 15 of NSF *Grant General Conditions* GC-1 (10/95)]. The report should summarize activity during the previous year, assess progress in meeting milestones set in the proposal or through negotiations, identify significant developments, and describe any problems encountered. Reprints of publications and draft materials produced as a result of the project must be provided as soon as they are available. Reports should also include any significant changes planned for the following year. All projects should submit an updated data sheet each year. Annual reports must certify progress on meeting cost-sharing requirements stipulated in the award and must be submitted using NSF Form 1328 available in the ***GPG*** **(NSF 95-27)**.

Final Report. Within 90 days after grant expiration, the PI must submit a signed Final Project Report (NSF Form 98A), including the Part IV Summary, to the NSF Program Officer, with a copy to the Authorized Organizational Representative. Applicants should review this form prior to proposal submission so that appropriate tracking mechanisms are included in the evaluation plan to ensure that complete information will be available at the conclusion of the project. Failure to provide final technical reports may prevent funding of subsequent proposals and/or will delay NSF review and processing of pending proposals for that PI and any co-PIs.

The final report should contain technical information needed by NSF for program management and informing the public about the results of supported activities. The report requests information on the gender, race, ethnicity, citizenship, and disability status of individuals supported under the grant. See earlier sections on program descriptions for any special programmatic requirements. The final report should also include certification of cost-sharing as stipulated in the award letter. Projects must transmit final copies of instructional materials developed under grants both to the relevant program (e.g., IMD) and to the Eisenhower National Clearinghouse.

Final expenditure information is supplied by most grantees through the quarterly Federal Cash Transactions Report (SF 272), normally submitted (including a signed certification) by the grantee's financial officer.

ACKNOWLEDGMENT OF NSF SUPPORT AND DISCLAIMER

Appropriate acknowledgment of NSF support should be given to NSF-supported projects. Individual programs will inform grantees of specific requirements, if any, for funding credit. A disclaimer must appear in publications of any material, whether copyrighted or patented on, or developed under, NSF-supported projects:

> "This material is based upon work supported by the National Science Foundation under Grant No. (grantee should enter NSF grant number)."
>
> The following disclaimer should also be included:
>
> "Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation."

COMMERCIAL PUBLICATION OR DISTRIBUTION OF NSF-SUPPORTED MATERIALS

The National Science Foundation encourages the broad dissemination of materials resulting from NSF awards. The proposal should identify and briefly describe the materials, proposed media and format, objectives of materials, grade levels, expected market, expected market life, expected need for revisions, and existing or proposed materials with which they might compete. If this award involves the development of materials or publications which will be disseminated commercially, the grantee is responsible for developing, documenting and implementing a publication or distribution plan which includes, at a minimum, the following elements:

- procedures to be followed for selection of a publisher or distributor so as to ensure reasonable competition or justification for non-competitive selection;
- delineation of the criteria used in the selection of the publisher or distribution; and,
- steps taken to prevent conflicts of interest in the selection of a publisher or distributor.

The grantee shall ensure that the publisher or distributor of any material supported under this NSF award agrees to provide the Government with a royalty-free license to use the materials for Government purposes as described in *Grant General Conditions GC-1 (10/95)* Article 18. Any publication or distribution agreement must be consistent with *GC-1* Article 20. Any materials developed under an award to a Federal Demonstration Project, must ensure that the publisher or distributor of any material supported under the NSF award agrees to provide the Government with a non-exclusive, nontransferable, irrevocable, royalty-free license to exercise or have exercised for or on behalf of the United States throughout the world all the exclusive rights provided by the copyright. Such license does not include the right to sell copies or photo records of the copyrighted works to the public. Any publication or distribution agreement must be consistent with FDP-III, Article 10.

Normally, income generated as a result of commercial publication and/or distribution of NSF-supported materials will be subject to guidance provided in Section 750 of the ***GPM*** with the exception that royalty income earned during the life of the project should be used to further project objectives. The grantee is required to retain appropriate financial and other records relating to project income earned during the grant period and for three years beyond the end of the grant period. The grantee's understanding and acceptance of these income procedures should be provided in the proposal.

LEGAL RIGHTS TO INTELLECTUAL PROPERTY

NSF normally allows awardees to retain principal legal rights to intellectual property developed under its awards. This policy provides incentive for development and dissemination of inventions, software, and publications that can enhance their usefulness, accessibility, and upkeep. It does not, however, reduce the responsibility of PI and their institutions to make results, data, and collections available to educational and other appropriate communities.

Nevertheless, NSF remains committed to the development of high-quality programming that will be made widely available to all children, youth, and adults. The Foundation requires that —

- broadcasts, exhibits, books, and other materials include a clear documentation of the source(s) of support (both NSF and other contributors), as well as the NSF logo;
- copies of all developed materials (e.g., videotapes of programs, a teacher's guide) be provided to NSF;
- the US Government be provided a royalty-free license in perpetuity to use the materials for Government purposes; and, in accordance with ***GPM*** 730,
- an annual progress report on project activities be provided to the cognizant NSF Program Officer.

Under normal circumstances, NSF also requires that —

- off-the-air recording rights for supported television programs be offered to educational agencies or institutions for a minimum of three years following the first broadcast; and,
- all television programs have closed captions encoded on the master broadcast tape and be broadcast with the closed captions.

APPENDICES

I. Checklist for Proposal Preparation

II. Data Sheet: Informal Science Education (ISE) Programs

III. Data Sheet: Parent Involvement Projects

IV. Data Sheet: Instructional Materials Development

V. Data Sheet: Implementation and Dissemination Projects

VI. Data Sheet: Teacher Enhancement

VII. Data Sheet: Advanced Technological Education

VIII. NSF Major Systemic Projects

APPENDIX I
Checklist for Proposal Preparation

Complete proposals expedite review and processing. Your proposal should include all materials below in the order listed below. All NSF Forms can be obtained in ***GPG (NSF 95-27)*** or the ***Proposal Forms Kit (NSF 95-28)***. Forms marked with an asterisk (*) are included in this Announcement.

- ☐ **Transmittal Letter**. Include preliminary proposal or previous declination number. ONE COPY ONLY should be attached to the original signature copy of the proposal.

- ☐ **Supplementary Information on Principal Investigators/Project Director** *(NSF Form 1225)*. ONE COPY ONLY should be attached to the original signature copy of the proposal.

- ☐ **Cover Sheet** *(NSF Form 1207, revised 7/95)*. Enter the applicable program in the box in the upper left corner. Include all required signatures: Principal Investigator/Project Director, Co-Principal Investigator(s)/Co-Project Director(s), and an authorized organizational representative. Page 1— all copies; page 2—original signature copy only).

- ☐ **Project Summary** *(NSF Form 1358).*

- ☐ *** Program Data Sheet.**

- ☐ **Table of Contents** *(NSF Form 1359).*

- ☐ **Project Description.** Do not exceed page limitations; include results from prior NSF support, if applicable *(NSF Form 1360).*

- ☐ **References Cited** *(NSF Form 1361).*

- ☐ **Biographical Sketches of Key Personnel** *(NSF Form 1362).* Limit two pages per investigator.

- ☐ **Budget** *(NSF Form 1030).* If project is more than one year in duration, provide a cumulative budget for the full term and individual budget forms for each year the project will be in operation.

- ☐ **Budget Justification.**

- ☐ **Current and Pending Support** *(NSF Form 1239).*

- ☐ **Appendices.**

- ☐ One copy of the proposal sent directly to the Division; other required copies to NSF Proposal Processing Unit (ISE, IMD, TE, PARENT, IMPLEMENTATION) or Friday Systems Services (for ATE only).

APPENDIX II
INFORMAL SCIENCE EDUCATION

Project Data Sheet

(One copy must be completed and sent in with the proposal)

A. Project Information:

Principal Investigator: _____

Project Title: _____

Institution: _____ State: _____

Phone: _____ FAX: _____ E-mail: _____

B. Funding Information:

Total NSF/ISE Request $ _____

Total Auditable Cost-Sharing $ _____

Total Non-auditable Cost-Sharing $ _____

Sources of Cost-Sharing: [Sum = 100]

NSF, other:	_____%	Corporate:	_____%
Grantee Institution:	_____%	Project Generated:	_____%
Other Foundations:	_____%	Other (explain):	_____%
Other Federal Agencies:	_____%	_____	

C. Science /Mathematics Content: [Sum = 100]

Astronomy (11)	_____%	Social Sciences (80)	_____%
Biology (61)	_____%	Technology	_____%
Chemistry (12)	_____%	Elem. School Sci. (01)	_____%
Computer Science (31)	_____%	Elem. School Math (02)	_____%
Earth Science (42)	_____%	Mathematics (21)	_____%
Engineering (50)	_____%	Algebra (04)	_____%
Environmental Science (40)	_____%	Geometry (05)	_____%
Life Sciences (60)	_____%	Pre-calculus (06)	_____%
Physics (13)	_____%	Calculus (07)	_____%
Physical Sciences (10)	_____%	Probability/Statistics (08)	_____%
Psychology (70)	_____%	Geography (88)	_____%

D. Number of Participants or Potential Impact on Target Audience: [Yearly] _____

E. Level of Participants/Target Audience: [Check all that apply]

Preschool	_____	Undergraduate	_____	Family (multigenerational)	_____
Elementary	_____	Secondary	_____	Other (explain)	_____
Middle School	_____	Adult	_____	_____	

F. Special Emphases: [Check all that apply]

Minorities	_____	Urban	_____
Women	_____	Rural	_____
Persons with Disabilities	_____	Other (explain)	_____

G. Scope: [Check all that apply] Local _____ Regional _____ National _____

APPENDIX III
PARENT INVOLVEMENT IN SCIENCE, MATHEMATICS, AND TECHNOLOGY EDUCATION

Project Data Sheet

(A completed project data sheet must accompany the proposal)

A. Project Information

Principal Investigator: _____

Project Title: _____

Institution: _____ State: _____

Phone: _____ FAX: _____ E-mail: _____

Total NSF/Parent Request $ _____ Total, Non-auditable Cost-Sharing $ _____

Auditable Cost-Sharing $ _____ (Exclude all Federal funds)

B. Other Funding Sources (Sum = 100%)

NSF, Other: _____% Other Fed. Agencies: _____%

Grantee Organization: _____% Corporate: _____%

Foundations: _____% Other: (Explain) _____%

_____

C. Locale of Participants _____ (Use up to six two-letter state abbreviations. Projects in more than six states should be identified as Regional or National in "D" below.)

D. Scope Regional _____ National _____

E. Type of Project (Check all that apply)

Formal Education (tied to school) _____ Informal Education (e.g., media, museums) _____

Materials Development _____ Forums/Discussion Groups _____

Hands-On Workshops _____ Skills Development _____

Other (Describe) _____

F. Project Content Area (Sum = 100%)

Computer Sci. (31) _____% Engineering (50) _____% Environmental Sci(40) _____%

Life Sciences (60) _____% Physical Sciences (10) _____% Social Sciences (80) _____%

Technology _____% Elem. School Sci. (01) _____% Elem. School Math(02) _____%

Mathematics (21) _____% Other _____%

G. Educational Technologies Integral to the Project (Check if "YES") ____

H. Project Target Audience (Check all that apply)

Parents _____ Teachers _____

School Administrators _____ Caregivers _____

Others (Explain) _____

I. Estimated Number of Participants: (yearly) ___

J. Target Population (Check all that apply)

Minorities ___ Rural ___ Urban ___ Other ___

APPENDIX IV
INSTRUCTIONAL MATERIALS DEVELOPMENT

Project Data Sheet

(One copy must be completed and sent in with the proposal)

A. Project Information:

Principal Investigator: _____

Project Title: _____

Institution: _____ State: _____

Phone: _____ FAX: _____ E-mail: _____

B. Funding Information:

Total NSF/ISE Request $ _____

Total Auditable Cost-Sharing $ _____

Total Non-auditable Cost-Sharing $ _____

Sources of Cost-Sharing: [Sum = 100]

NSF, other:	_____%	Corporate:	_____%
Grantee Institution:	_____%	Project Generated:	_____%
Other Foundations:	_____%	Other (explain):	_____%
Other Federal Agencies:	_____%	_____	

C. Science /Mathematics Content: [Sum = 100]

Astronomy (11)	_____%	Social Sciences (80)	_____%
Biology (61)	_____%	Technology	_____%
Chemistry (12)	_____%	Elem. School Sci. (01)	_____%
Computer Science (31)	_____%	Elem. School Math (02)	_____%
Earth Science (42)	_____%	Mathematics (21)	_____%
Engineering (50)	_____%	Algebra (04)	_____%
Environmental Science (40)	_____%	Geometry (05)	_____%
Life Sciences (60)	_____%	Pre-calculus (06)	_____%
Physics (13)	_____%	Calculus (07)	_____%
Physical Sciences (10)	_____%	Probability/Statistics (08)	_____%
Psychology (70)	_____%	Geography (88)	_____%

D. Pilot/Field Testing Participation:

Pilot Test Sites (#)	_____	Field Test Sites (#)	_____
Students (#)	_____	Students (#)	_____
Title I Eligible	_____	Title I Eligible	_____
Underrepresented (e.g., African American, Hispanic, Native American)	_____	Underrepresented (i.e., African American, Hispanic, Native American)	_____
Teachers (#)	_____	Teachers (#)	_____

E. Level of Participants: [Check all that apply]

Preschool	____	Undergraduate	____
Elementary	____	Parents	____
Middle	____	Other (explain)	____
Secondary	____	_____	

F. Special Emphases: [Check all that apply]

Minorities	____	Urban	____
Women	____	Rural	____
Persons with Disabilities	____	Other (explain)	____
		_____	

G. Scope: [Check all that apply] Local _____ Regional _____ National _____

APPENDIX V
IMPLEMENTATION AND DISSEMINATION PROJECTS

Project Data Sheet

(A completed project data sheet must accompany the proposal)

A. Project Information

Principal Investigator: _____

Project Title: _____

Institution: _____ State: _____

Phone: _____ FAX: _____ E-mail: _____

Total NSF/Parent Request $ _____ Total, Non-auditable Cost-Sharing $ _____

Auditable Cost-Sharing $ _____ (Exclude all Federal funds)

B. Other Funding Sources (Sum = 100%)

NSF, Other: _____% Other Fed. Agencies: _____%

Grantee Organization: _____% Corporate: _____%

Foundations: _____% Other: (Explain) _____%

Publishers: _____% _____

C. Members of Partnership (List participants providing essential expertise)

Universities and Colleges_____

Publishers _____

Instructional Materials Developers_____

For-profit/non-profit Businesses_____

Private Foundations_____

State/Local Education Agencies_____

Federal Facilities _____

Other _____

D. Characteristics (Check all that apply)

Disciplinary Areas: Science _____ Mathematics _____

Grade Level: K _ 1 _ 2 _ 3 _ 4 _ 5 _ 6 _ 7 _ 8 _ 9 _ 10 _ 11 _ 12 _

Focus:

National ___ Regional ____ (List states, up to six) ___

Curriculum/instructional materials offered (list all that apply)_____

_____

_____

_____

_____

_____

_____

E. Products/Activities (Check all that apply)

Assistance to Districts:

Needs assessment ___
Curriculum adoption/implementation ___
Develop resources (demonstration sites, videos, simulations, telecommunications) ___
Utilization of educational technologies ___
On-site, follow-up activities with districts ___

Instructional Materials Support:

Assessing alignment of instructional materials to standards ___
Alignment of instructional materials across grade levels ___
Assistance in student assessment strategies ___

District Professional Development Support:

Planning of professional development activities to support curriculum ___
Identification of professional development tools ___
Enhancement of staff developers to support curriculum implementation ___

F. Impact

Number of districts to be served directly at site(s) (per year) _____/_____
Number of schools represented (per year) _____/_____
Number of students represented (per year) _____/_____
Number of participants to be served directly at site(s) (per year)
District administrators _____/_____
District Staff developers _____/_____
Resource/Lead Teachers _____/_____
Parent/Community Leaders _____/_____
Other _____/_____

APPENDIX VI
TEACHER ENHANCEMENT
Project Data Sheet
(A completed project data sheet must accompany the proposal)

A. Personal Information

Award Number: _____ Program Officer: _____
Title: _____
_____
Principal Investigator: _____
PI Address: _____
Phone: _____ FAX: _____ E-mail: _____
Institution: _____
Total NSF/TE Request $ _____ Total, non-Auditable Cost-Sharing $ _____
Auditable Cost-Sharing $ _____ (Exclude all Federal funds except Eisenhower & Chapter 1)

B. Other Funding Sources:

NSF Other (e.g. non-TE, USI, SSI): _____%
Grantee Organization: _____%
Foundations: _____%
Federal: _____%
Eisenhower: _____%
Chapter 1: _____%
Other Agencies _____%
State/Local (if not grantee): _____%
Industry: _____%
Other (explain): _____%

Area from Guidelines (check one)

Local Systemic Change _____
Materials for Professional Development _____
Teaching Enhancement:
Leadership _____
Research Experience for Teachers _____
Research Exp. For Teachers/Students _____
Replication & Scale-up _____
Professional Support for the Teaching Workforce _____
Planning _____

C. Science /Math Content: [Sum = 100]

Astronomy (11 _____%
Biology (61) _____%
Chemistry (12) _____%
Computer Science (31) _____%
Earth Science (42) _____%
Engineering (50) _____%
Environmental Sci. (49) _____%
General Science _____%
Other (explain) _____

Geography (88) _____%
Life Sciences (69) _____%
Mathematics (21) _____%
Physics (13) _____%
Physical Sciences (19) _____%
Psychology (70) _____%
Social Sciences (80) _____%
Technology _____%

D All Projects: For each calendar year that applies, estimate the number of teachers directly participating in the project and the number of hours of professional development (including follow-up activities) each teacher receives.

Direct, Including Repeating	Grades PreK-5	Grades 6-8	Grades 9-12	Prof. Development Hours/Teacher
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				
Project Total				

Indicate the number of **different** teachers served directly over the course of the project per year: _____ over the life of the project: _____.
For Teacher/Student Research Experience Projects indicate the number of students directly participating with teachers per year—_____; over the life of the project—_____.

Leadership Projects Only: Estimate the number of second-tier teachers enhanced by the project each year and the number of equivalent hours of professional development (including follow-up activities) that these teachers receive.

Indirectly served teachers	Grades PreK-5	Grades 6-8	Grades 9-12	Prof. Development Hours/Teacher
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				
Project Total				

Local Systemic Change Projects Only: Report data for all schools in all districts that participate in the project.

	Number of Schools	Number of Teachers	Math Teachers	Science Teachers
Elementary			n/a	n/a
Middle				
High School				
Project Total				

Applicants selected from:
___ Region (single states; "neighboring" states) List: _____
___ Local (single city; school district; USI city, if applicable) List: _____
___ National

E. **Materials for Professional Development:** Projects focusing on production, testing, evaluation, and/or wide dissemination of materials that enhance teachers in:
___ mathematics and/or science content knowledge
___ research-based teaching strategies
___ knowledge and use of new classroom assessment strategies
___ knowledge and selection of exemplary teaching resources
___ use of particular instructional programs
___ Other: (explain) _____

F. Focus on development and evaluation of effective techniques for motivation and retention in science and mathematics of:
___ minorities ___ women ___ disabled persons
___ gifted/talented ___ underserved (e.g., rural, inner-city)
___ other (explain) _____

G. Provides professional development for implementing NSF-supported instructional materials. Name: _____
_____
_____

H. **Technology Projects Only:** Does the project teach teachers how to use networking or computer technologies for:
___ professional use (accessing resources, collaborating with colleagues, etc.)
___ teaching students to use the technology (programming, access libraries, interface instruments, etc.)
___ other (explain) _____

If the project uses networking for teachers, do they have access to the Internet?_____

Does your project use Distance Learning to deliver instruction to teacher? _____
If so, how is it delivered:
_____ satellite _____ two-way broadcast _____ network
_____ other: (explain) _____

APPENDIX VII
ADVANCED TECHNOLOGICAL EDUCATION (ATE) PROGRAM
Project Data Sheet
(A completed project data sheet must accompany the proposal)

The instructions and codes to be used in completing this form begin on the next page.

1. Type of Submission: _____

2. Name of Principal Investigator/Project Director (as shown on the Cover Sheet): _____
_____

3. Name of Submitting Institution (as shown on the Cover Sheet): _____
_____

4. Other institutions involved in the project's operation: _____
_____

PROJECT CODES

Preliminary Proposal Number(s) that led to this proposal _____

A. Major Discipline Code: _____

Subfields: _____

B. Academic Focus Level of Project: _____

C. Highest Degree Code: _____

D. Category Code _____

E. Business/Industry Participation Code: _____

F. Audience Code: _____

G. Institution Code: _____

H. Strategic Area Code: _____

Estimated number in each of the following categories to be directly affected by the activities of the project during its operation:

I. Undergraduate Students: _____

J. Pre-college Students: _____

K. College Faculty: _____

L. Pre-college Teachers: _____

M. Total Non-NSF Contribution: $ _____

Project Summary:
The Summary of Proposed Work should be a concise description of the project limited to 22 lines of 12-point or larger font of plain white paper.

INSTRUCTIONS AND CODES FOR COMPLETING ATE PROJECT DATA FORM

Item 1 Indicate the program to which the proposal is being submitted:

ATE:	Advanced Technological Education
CETP:	Collaboratives for Excellence in Teacher Preparation
CCD:	Course and Curriculum Development Projects
CCD-IR:	Institution-Wide Reform of Undergraduate Education
ILI-IP:	Instrumentation and Laboratory Improvement—Instrumentation Projects
ILI-LLD:	Instrumentation and Laboratory Improvement—Leadership in Laboratory Development
UFE:	Undergraduate Faculty Enhancement

Item 2 Indicate what Type of submission this is:

PR:	Proposal for a Project (ATE, CETP, CCD, CCD-IR, ILI-IP, ILI-LLD, UFE)
PM:	Preliminary proposal for a Project (ATE and CETP only)
PC:	Preliminary proposal for a Center (ATE only)
CE:	Proposal for a Center (ATE only)

Item 3 Enter the **Name of the Principal Investigator/Project Director.**

Item 4 Enter the **Name of the Submitting Institution,** including the branch or campus.

Item 5 List any **Other Institutions Involved** in the operation of the project: directly, through subcontracts, or through shared use of equipment.

Code A Select a two-digit **Major Discipline Code** that corresponds to the Field that is most descriptive of your proposal area (see attached table). Then fill in one or more **Sub-fields** that best describes the specific area where your proposal applies. The list is not all-inclusive; use other, similar terms if they are more appropriate. Applicants to Advanced Technological Education and others interested in enhancing Engineering Technology programs should select 58 as the major discipline code and then select the appropriate disciplinary code(s) for subfields. For example, a Chemical Engineering Technology program would select 58 as the major code and 53 as the subfield. Those interested in Science Technology programs should select the appropriate major discipline code. For example, a Chemical Technology Program would select 12 as the major code.

Code B Enter **Academic Focus Level Code** of the project. That is, the project or workshop will develop or implement curricular or laboratory material for eventual presentation at what academic level: **LO** = lower division undergraduate courses; **UP** = upper division undergraduate courses; **BO** = both divisions of undergraduate courses; **PC** = pre-college courses (K-12); **AL** = pre-college and undergraduate courses.

Code C Enter the **Highest Degree Code** to indicate the highest degree offered in science or engineering by any department on the campus submitting this proposal: (**A** = Associate; **B** = Baccalaureate; **M** = Masters; **D** = Doctorate; **N** = Non-academic institutions).

Code D Enter the proper Category Code depending on the program:

ATE:	Indicate whether this project focuses on a **CE** = Center; or **PR** = Project
CETP:	Indicate whether the project focuses on preparing **ET** = elementary school teachers, **MS** = middle school teachers, **SS** = secondary school teachers, or **CM** = comprehensive.
CCD:	Indicate whether the project is an **IC** = individual course project; or a **CC** = comprehensive curriculum development project.
ILI:	No category code needed.
UFE:	Indicate whether the project is a **CO** = 2-year college and 4-year college/university coalition; or **SP** = standard project.

Code E If the project has major participation by the private sector (commercial and industrial organizations), indicate by entering **PS**; otherwise leave blank.

Code F For those proposals where a **significant** component of the project is the education of the following groups, indicate the proper **Audience Code(s)**. Indicate codes also if the institution has as its mission the education of one or more groups. *Each group indicated must be discussed explicitly and substantively in the proposal narrative.* Codes: **W** = Women; **M** = Minorities; **D** = Persons with Disabilities; **T** = Pre-Service Teachers; **H** = Technicians and Technologists; **I** = In-Service Teachers; **S** = Secondary School Students

Code G Enter the **Institution Code** to indicate whether the (lead) institution is: **PUBL** = Public; **PRIV** = Private; **CONS** = Consortium; **NACD** = Non-academic.

Code H If applicable, indicate that the project has a strategic area focus by entering an appropriate code according to the following: **GC** = Global Change; **HPC** = High Performance Computing; **EN** = Environment; **MA** = Manufacturing; **BT** = Biotechnology; **AMP** = Advanced Materials and Processing; **CI** = Civil Infrastructure Systems.

Codes J-M Give your best estimate of the numbers of persons in the indicated categories who will receive immediate benefit from the project (primary effect) or are likely to immediately benefit as a result of another person's participation (secondary effect) during the period the project is in operation (including intermediate periods for seasonal projects). Note that the period of operation may extend beyond the expected period of NSF funding.

Codes N Give your best estimate of the total dollar value of the cumulative institutional cost-sharing, if any, to be provided.

The **Summary of the Proposed Work** should be a concise description of the project. It is limited to 22 single-spaced lines of standard-sized 12 point font. See the instructions in the subsection on the Project Data and Summary Form.

MAJOR DISCIPLINES

Major Code	*Dicipline Field*	*Subfields (List all that apply)*
11	**ASTRONOMY**	Astrophysics; Cosmology; General and Introductory Astronomy; Optical Astronomy; Radio Astronomy; Solar Astronomy; X-Ray, Gamma-Ray and Neutrino Astronomy; Other (Specify).
12	**CHEMISTRY**	Analytical Chemistry; General and Introductory Chemistry; Inorganic; Organic; Physical; Surface Chemistry; Polymers; Chemical Technology; Other (Specify); (See Life Science for Biochemistry)
31	**COMPUTER SCIENCE AND COMPUTER ENGINEERING**	Computer Architecture; Computer Networks; Computing Methodologies; Computing Milieu; Computer Systems Organization; Databases; General and Introductory Programs; Hardware; Information Systems; Intelligent Systems; Mathematics of Computing; Robotics; Signal Processing; Software; Theory of Computing; VLSI Design. (Note: Computer Applications should be included in the specific field use).
	ENGINEERING	
51	**Aeronautical Engineering**	Aerodynamics; Aerospace; General and Introductory Programs; Space Technology.
53	**Chemical Engineering**	General and Introductory Programs; Petroleum; Petroleum Refining; Process.
54	**Civil Engineering**	Architectural; General and Introductory Programs; Hydraulic; Hydrologic; Marine; Sanitary and Environmental; Structural; Transportation.
55	**Electrical Engineering**	Acoustics; Antennas; Circuits; Bio-Engineering; Communications; Computers; Controls; Electromagnetics; Electronics; General and Introductory Programs; Information Theory; Instrumentation; Microwaves; Optics; Power; Reliability; Robotics; Signal Processing.
56	**Mechanical Engineering**	Fluids; General and Introductory Programs; Heat Transfer; Instrumentation; Mechanical Systems; Robotics.
57	**Materials Science and Engineering**	Ceramics; Electronic Materials; Metallurgy; Polymers; Composite Materials; Materials Characterization; Materials Synthesis and Processing; Instrumentation.
58	**Engineering Technology**	Aeronautical; Civil; Computer; Communications; Electrical; Electronic; Industrial; Manufacturing; Materials; Mechanical; Marine; Nuclear; Systems; Technology Education; Other.
59	**Engineering, Other (Specify)**	Agricultural; Bioengineering; Industrial and Management; Nuclear; Ocean Engineering; Manufacturing, Systems Engineering. (Includes Interdisciplinary or Multidisciplinary projects that involve the Engineering disciplines only).
	GEOLOGICAL SCIENCES	
41	**Atmospheric Sciences**	Aeronomy; Atmospheric Chemistry; Climate Dynamics; General and Introductory Programs; Extraterrestrial Atmospheres; Magnetospheric Physics; Meteorology; Solar Terrestrial Research.

MAJOR CODES *continued*

Major Code	*Dicipline Field*	*Subfields (List all that apply)*
42	**Geology**	General Geology; Structural Geology; Tectonics; Remote Sensing; Planetology; Surface Processes; Organic Geochemistry; Geophysics; Hydrology; Inorganic Geochemistry; Mineralogy; Paleontology; Petrology; Seismology; Soil Sciences.
44	**Oceanography**	Biological, Chemical, and Physical Oceanography; Marine Geology; Geophysics.
99	**INTERDISCIPLINARY/ MULTIDISCIPLINARY**	To be used for projects in areas where two or more major disciplines meet but are not elsewhere classified, and for multidisciplinary projects. (Specify what subfields are involved.) This category is also appropriate for CETP projects in Science Education, Mathematics Education, and Technology Education.
61	**LIFE SCIENCES**	Animal Sciences; Bacteriology; Biochemistry; Biogeography; Biophysics; Biotechnology; Ecology; Embryology; Environmental Technology; Evolutionary Biology; Genetics; Food Science; Immunology; Microbiology; Neurology; Nutrition and Metabolism; Physical Anthropology; Physiology; Plant Sciences; Radiobiology; Systematics; Biology Other (Specify). (List Behavioral Biology here if it is taught by the Biology faculty).
21	**MATHEMATICS**	Algebra; Analysis; Applied Mathematics; Discrete Mathematics; Computational Mathematics; Foundations and Logic; Geometry; Number Theory; Numerical Analysis; Probability; Statistics; Topology.
91	**OTHER SCIENCES (Not Elsewhere Classified)**	Effects of Sciences and Technology on Society; Ethical Considerations; Technology Assessments.
13	**PHYSICS**	Acoustics; Atomic and Molecular; Elementary Particles; General and Introductory; Gravitation; Nuclear; Optics; Plasma; Condensed Matter Physics; Low Temperature Physics; Solid State Physics; Polymers.
71	**PSYCHOLOGY, BIOLOGICAL AND COGNITIVE ASPECTS**	Physiological Psychology, Behavioral Neuroscience, Cognitive Neuropsychology, Comparative Cognition, Perception, Psychophysics, Cognitive Science, Human Factors, General/Introduction to Psychology.
72	**PSYCHOLOGY, SOCIAL ASPECTS AND METHODOLOGY**	Developmental Psychology, Personality, Social Psychology, Cross-Cultural, Motivation, Industrial, Educational, Psychometrics, Research Methods.
	SOCIAL SCIENCES	
81	**Anthropology**	Applied Anthropology (Note: Excludes Physical Anthropology which is under Life Sciences), Archaeology; Cultural and Personality; Social and Ethnology.
82	**Economics**	Econometrics and Economic Statistics; History of Economic Thought; International Economics; Industrial Labor and Agricultural Economics; Macro-economics; Micro-economics; Public Finance and Fiscal Policy; Theory; Economic System and Development.
83	**History**	History and Philosophy of Science.

MAJOR CODES *continued*

Major Code	*Dicipline Field*	*Subfields (List all that apply)*
84	**Linguistics**	Anthropological-Archaeological; Computational; Psycholinguistics; Sociolinguistics.
85	**Political Science**	Area or Regional Studies; Comparative Government; History of Political Ideas; International Relations; National Political and Legal Systems; Political Theory; Public Administration.
86	**Sociology**	Comparative and Historical; Complex Organizations; Culture and Social Structure; Demography; Group Interactions; Social Problems and Social Welfare; Sociological Theory.
88	**Geography**	Locational Analyses of Population; Economics, Geographic Information Systems; Social; and Settlement Systems; Physical Systems and Resource Use; Spatial Behavior and Decision Making; and Spatial Analytic Methods.
89	**Social Sciences, Other**	(Specify). Includes the Human Aspects of Law, and all Interdisciplinary and Multidisciplinary projects that involve the Social Sciences only. Excludes Business Administration and Social Work.

APPENDIX VIII
NSF MAJOR SYSTEMIC PROJECTS *(as of October 1996)*

Local Systemic Change (LSC) Projects
Teacher Enhancement (TE) Program

CITY	STATE	DISTRICT
	Mathematics, Grades K-8	
Fullerton	**CA**	Santa Ana
Santa Barbara	**CA**	Two CA School Districts
College Park	**MD**	Baltimore
Rochester	**NY**	Rochester
	Mathematics, Grades 7-12	
Tempe	**AZ**	Five AZ Districts
Pomona	**CA**	Four LA County Districts
Chicago	**IL**	Chicago
Seattle	**WA**	Six Adjacent Districts
	Mathematics, Grades K-12	
San Diego	**CA**	16 CA Districts
Boston	**MA**	20 New England Districts
Waltham	**MA**	Waltham
Pittsburgh	**PA**	Pittsburgh
	Science and Mathematics, Grades K-8	
Mesa	**AZ**	Mesa
Fresno	**CA**	Fresno
Montclair	**NJ**	Two Adjacent Districts
Rahway	**NJ**	One PA and 3 NJ Districts
Las Vegas	**NV**	Las Vegas
	Science, Grades K-8	
Anchorage	**AK**	Anchorage
Huntsville	**AL**	Five Adjacent Districts
La Jolla	**CA**	National School District
Oakland	**CA**	Oakland
San Francisco	**CA**	San Francisco
Santa Cruz	**CA**	Santa Cruz
Atlanta	**GA**	Atlanta
Muncie	**IN**	Ft Wayne & Six Adjacent Districts
Midland	**MI**	Midland
Bozeman	**MT**	14 MT Districts
Princeton Junction	**NJ**	Three NJ Districts
Buffalo	**NY**	Buffalo
New York	**NY**	Two NYC School Districts
Stark	**OH**	17 Adjacent School Districts
Pittsburgh	**PA**	15 Adjacent School Districts
Providence	**RI**	8 RI School Districts
Nashville	**TN**	Nashville
Seattle	**WA**	3 Rural WA School Districts
Seattle	**WA**	Seattle

APPENDIX VIII, *continued*
Division of Educational System Reform

STATEWIDE SYSTEMIC INITIATIVES	URBAN SYSTEMIC INITIATIVES	RURAL SYSTEMIC INITIATIVES
Arkansas	Baltimore, MD	Alaska
California	Chicago, IL	
Colorado	Cincinnati, OH	California
Connecticut	Cleveland, OH	*Includes parts of CA, AZ, NV*
Delaware	Columbus, OH	
Georgia	Dallas, TX	Kentucky
Kentucky	Detroit, MI	*Includes parts of KY, NC, OH, TN, VA, WV*
Louisiana	El Paso, TX	
Massachusetts	Fresno, CA	Louisiana
Maryland	Los Angeles, CA	*Includes parts of LA, AR, MS*
Maine	Memphis, TN	
Michigan	Miami, FL	North Dakota
Montana	New Orleans, LA	*Includes parts of ND, MT, NB, SD, WY*
Nebraska	New York, NY	
New Jersey	Phoenix, AZ	New Mexico
New Mexico	Philadelphia, PA	*Includes parts of NM, AZ, CO, UT*
New York		
Ohio		
Puerto Rico		
South Carolina		
South Dakota		
Texas		
Vermont		

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The Foundation welcomes proposals from all qualified scientists and engineers and strongly encourages women, minorities, and persons with disabilities to compete fully in any of the research related programs described here. 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 subject to discrimination under any program or activity receiving financial assistance from the National Science Foundation.

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 projects. See the program announcement or contact the program coordinator at (703)306 1636.

Catalog of Federal Domestic Assistance Number: 47.076 Education and Human Resources

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