

MIDDLE GRADES SCIENCE INSTRUCTIONAL MATERIALS INITIATIVE

PROGRAM SOLICITATION NSF 00-80

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

DEADLINE DATES:

Preliminary Proposals: July 14, 2000 (Phase I)

Full Proposals: October 20, 2000 (Phase I)



NATIONAL SCIENCE FOUNDATION

SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Name: Middle Grades Science Instructional Materials Initiative

Short Description/Synopsis of Program: This two-phased initiative seeks to develop a new generation of comprehensive science instructional materials for use in middle grades and the transition to high school (grades 6-10). Phase I focuses on the development, piloting, and field-testing of a single semester of prototype materials. In Phase I, the curriculum design is expected to build sequentially on identification of content skills, development of related assessments, and development of student learning materials. The National Science Education Standards are the foundation for the design process. The resulting learning materials are expected to serve the needs of students and their teachers well into the new millennium and to incorporate contemporary knowledge about student thinking, learning, pedagogy, assessment, and information technology. Support is provided to develop accompanying innovative professional development materials for classroom teachers; materials for administrators and parents/community members form a third component of the expected effort. Piloting and field-testing (validation) of the materials are expected to demonstrate evidence of enhanced student achievement; demonstration of such achievement is seen as an essential component of the evaluation process.

Subject to availability of funds, successful completion and evaluation of Phase I student, teacher, and parent/community materials, as well as successful review of a new proposal are preconditions for receipt of a Phase II award for completing curricula and related materials development. Phase II should also address issues of adoption and broad implementation.

Cognizant Program Officer(s): Dr. John S. Bradley, Section Head, Grades 7-12, Room 885, Division of Elementary, Secondary, and Informal Education (ESIE); telephone 703-306-1614, e-mail: jbradley@nsf.gov.

Applicable Catalog of Federal Domestic Assistance (CFDA) No.: 47.076 — Education and Human Resources

ELIGIBILITY

- ◆ Limitation on the categories of organizations that are eligible to submit proposals: **Organizations with a scientific and/or educational mission are eligible to submit proposals, including colleges and universities, state and local education agencies, professional societies, research laboratories, publishers of curriculum materials, private foundations, and other public and private organizations for profit or not-for-profit.**

- ◆ PI eligibility limitations: **None**
- ◆ Limitation on the number of proposals that may be submitted by an organization: **Only one proposal may be submitted by a Principal Investigator (PI) and s/he may collaborate in only one other proposal as a co-PI.**

AWARD INFORMATION

- ◆ Type of award anticipated: **Continuing Grant**
- ◆ Number of awards anticipated in FY 2001: **3-5 awards**
- ◆ Amount of funds available: **Up to \$4 million in FY 2001 for Phase I awards, pending availability of funds**
- ◆ Anticipated date of award: **April 2001**

PROPOSAL PREPARATION & SUBMISSION INSTRUCTIONS

- ◆ **Proposal Preparation Instructions**
 - Preproposal requirements: **Preliminary Proposal Required**
 - Proposal preparation instructions: **Standard NSF *Grant Proposal Guide* (GPG) (NSF 00-2) instructions, except as modified by this solicitation.**
 - Supplemental proposal preparation instructions: **None**
- ◆ **Budgetary Information**
 - Cost-sharing/matching requirements: **Cost-sharing of 5 percent of the total amount of NSF funds is required and should be detailed in the budget. Annual cost-sharing amounts should be shown on NSF Budget Form 1030, Line M.**
 - Indirect cost (F&A) limitations: **None**
 - Other budgetary limitations: **A proposal may be submitted for any funding amount up to \$2 million for up to 3.5 years. Modest requests to support acquisition of materials, supplies, equipment, and computing services are allowable. Funds are not available for the purchase of classroom equipment necessary to pilot- and field-test instructional materials.**

◆ **FastLane Requirements**

- FastLane proposal preparation requirements: **FastLane use required.**
FastLane point of contact: **Jeff Harris; 703-306-1620, jsharris@nsf.gov**
- Preliminary Proposal Deadline: **5:00 PM, local time, July 14, 2000 (FastLane)**
- Full Proposal Deadline: **5:00 PM, local time, October 20, 2000 (FastLane)**

PROPOSAL REVIEW INFORMATION

- ◆ Merit Review Criteria: **National Science Board (NSB) approved criteria, plus the additional criteria described in this solicitation.**

AWARD ADMINISTRATION INFORMATION

- ◆ Grant Award Conditions: **GC-1 or FDP III**
- ◆ Special grant conditions anticipated: **Cooperation with a National Committee of Advisors who will be identified by NSF to conduct program review and advise across projects. Each project is expected to have content advisers/reviewers, who will be selected in collaboration with NSF. Additional award conditions may be made addressing the pilot testing and evaluation of materials on pre-college students, and, particularly for Phase II awards, the distribution or commercial publication of materials developed, a license for government use, and program income.**
- ◆ Special reporting requirements anticipated: **Standard Annual Reports submitted via FastLane, with the possibility of requests for additional information/data. Such requests will be set as conditions to either the initial award or to continuing yearly increments.**

I. INTRODUCTION

This solicitation seeks development of a new generation of multi-year instructional materials to meet the needs and capture the interest of science students in the middle grades and/or in transition to high school (grades 6-10). These curricula are expected to carry students and their teachers well into the new millennium. The instructional materials should address the challenges of establishing an effective, contemporary learning environment that prepares students for advanced study, the workplace, and citizenship. The materials are expected to represent a comprehensive set of learning, teaching, and assessment resources for students, teachers, administrators, and parents/community members. In addition to building upon the National Science Education Standards¹, this new generation of materials is expected to build upon new approaches to teaching science currently evident at the elementary level.

The approach to instructional materials development requested in this solicitation is based upon findings of contemporary research on student learning in science, assessment of student learning outcomes, and effective teacher professional development. The science materials for middle grades and transition to high school require a new design model, referred to as assessment-led curriculum design.

The development process should proceed sequentially as follows:

- design begins with identification of student learning outcomes that are consistent with the National Science Education Standards;
- next, assessment instruments and/or tasks, appropriate for the identified student outcomes, are selected; and,
- third, other design considerations (e.g., identification and selection of content, instructional strategies) and development of materials are based on outcomes of the first two steps.

The need for effective middle grades instructional materials in science is highlighted by recent results of U.S. student performance on both national and international tests, such as the National Assessment of Educational Progress (National Center for Educational Statistics, 1998) and the Third International Mathematics and Science Study (TIMSS, 1996). Their findings indicate major shortcomings in students' understanding of basic scientific concepts.

Further, the TIMSS analysis draws attention to the important role that high quality instructional materials may play in improving student conceptual understanding. The findings as they relate to the United States have been summarized by Richard Elmore (National Academy of Science, 1997). The TIMSS findings are important, not so much for the international comparisons of achievement, as for providing insights into how science curricula are organized, taught, and

¹ National Academy of Sciences, 1996. National Science Education Standards, Washington, D.C.: National Academy Press. Support for national standards by state governments originated in 1989 with the National Governors Association (NGA) endorsement of national education goals. *National Science Education Standards* were developed with input from science teachers, scientists, science educators, and many others interested in science education.

learned across the U.S. Briefly, to strengthen U.S. curricula offerings, Elmore proposed the following.

- Curriculum design for science education in the U.S. should be more focused and less repetitious, providing a "strategic vision" of what students should know and be able to do.
- Science instruction in U.S. schools should be more ambitious in its expectations of students in that the "typical" U.S. student should study more demanding science content and be encouraged to increase the breadth and scope of subsequent science study.
- Instructional practice in science in U.S. schools should be based on more complex concepts and delivered with emphasis on deeper understanding of fundamental ideas than has traditionally been the case.

In addition, rapid development of technology is expected to have a significant impact on the next generation of instructional materials. The wide-spread availability of learning technologies raises issues about important aspects of curriculum design that can enable students to become effective, self-motivated, and independent learners. Information technologies, such as the World Wide Web, hold promise for dramatically increasing student and teacher access to scientific data and information. In this solicitation, technology is considered an essential component of the materials design.

Materials for teachers, administrators, as well as community/parents/caregivers are integral to this initiative. Therefore, this solicitation encourages the simultaneous development of materials that will address these audiences.

II. PROGRAM DESCRIPTION

Phase I (3.5 Years)—Phase I efforts are expected to provide a conceptual curriculum framework for the full set of materials, as well as for the initial development phase. Phase I will support development of prototype materials that should encompass the equivalent of a full semester of study and include student materials, assessment instruments and protocols, and supporting professional development materials, as well as sample materials for parents/caregivers and community members. The development of on-line resources for pilot and field-test teachers is also encouraged as a prototype for an on-going resource for implementation. The prototype materials must be field-tested in three different settings (i.e., urban, rural, and suburban) with students, teachers/administrators, and parents/caregivers/community members. Evaluation of prototype materials and student outcomes will provide the basis for decisions on Phase II funding. Phase I development strategies should guide completion of the full project throughout Phase II. Proposers are reminded that the new materials must reflect an outcomes-based approach to materials design. Outcomes (standards) are to be reinforced by the identification and specification of assessment protocols in absence of the complete conceptual development.

Phase II (5 Years)—A new proposal will be required for Phase II by the end of the third year of the Phase I activity. Subject to availability of funds, decisions will be made to provide a continuing grant for a Phase II effort, based on the quality and effectiveness of the prototype

materials from Phase I and on an evaluation of field-test results. Phase II proposals should outline plans to complete full development and evaluate the remaining materials in field-test sites. Materials must be ready for implementation in schools by the end of the third year of Phase II. Project activities in the final two years should engage in ongoing implementation and professional development for teachers in field-test sites with appropriate assessments to document consistent gains in student achievement. Evaluation of outcomes should be collected for diverse student populations (e.g., by gender, by race/ethnic origin); disaggregated data should document effectiveness for high performers, as well as for students traditionally less interested in the sciences. During this Phase, commitment and/or active involvement of a publisher is required to help create, test, develop, and market the materials for adoption and implementation across the nation.

MATERIALS CHARACTERISTICS

The proposed multi-year instructional science materials for middle grades may use various structures and formats, e.g., single discipline, interdisciplinary, thematic, integrated, or multi-disciplinary. The materials should address the needs of a diverse range of students. The standards-based curriculum models to be developed must:

- reflect contemporary research findings regarding student learning, pedagogy, and assessment;
- incorporate advances in education and information technologies into instructional materials design;
- build conceptual understanding from middle grades through high school grades;
- be accompanied by professional development materials to improve teachers' knowledge of requisite content and teaching strategies (especially on-line resources that can be regularly updated); and
- provide supporting materials to advise administrators on implementation issues, as well as engage and inform local community members (i.e., parents, primary care givers, school board members, business representatives) about the role these materials play in delivering high quality science education for all students.

DESIGN REQUIREMENTS²

Successful proposals must be based upon findings from current research on science learning and must address the following components:

Strategies for Meaningful Learning--Grade 6-10 science instructional materials should incorporate the following insights into student learning and interest in science, as documented in science education research (National Academy of Science, 1996; American Association for the Advancement of Science, 1989 & 1993).

- Instructional materials should focus on the most important scientific concepts and skills, thus emphasizing understanding over coverage and quality over quantity.
- Topics should be introduced in a recognizable context, followed by learning experiences that challenge student preconceptions of the natural and designed world.
- Instructional materials and learning experiences should provide opportunities for students to construct conceptual understanding and to develop scientific process skills, such as collecting, organizing, analyzing, and evaluating evidence as well as building inferences and arguments.
- Learning materials should include illustrations of the contributions of, and provide relevant context for, those population groups traditionally underrepresented in science and underserved in science education.

Authentic Assessment--Assessment instruments are an important design consideration. In order to meet national standards and to provide reliable and valid data, assessments need to measure outcomes of significance; use tasks representative of student learning activities; include tasks embedded in real-world contexts, and assess conceptual understanding and problem-solving skills.

Multiple assessment strategies should be employed for both formative and summative assessments to determine the extent to which students have attained desired learning outcomes. Assessment strategies should allow monitoring of student performance across entire courses of study. Student performance assessments should also provide:

- feedback to students and teachers that improves learning experiences and provides data for evaluating student performance;
- information for parents/primary caregivers and administrators about student achievement both from assessments designed for the curricula and from national or state-recognized tests; and,
- data for teachers and administrators to evaluate the quality of the learning materials, to

² Science materials (grades 6-10) that are currently under development, as appropriate, may elect to realign their designs and add the teacher/administrator/parent components in order to meet the goals of this solicitation. Proposals to realign materials currently under development may be considered under Phase I of this solicitation or as revisions of materials found in ESIE's current guidelines.

guide future development of learning experiences, and to inform policies involving science instructional materials.

Professional Development--Research indicates that ongoing professional support for teachers and administrators is needed for effective implementation of new instructional materials. The best instructional materials, by themselves, do not ensure substantive improvements in science education. Materials that provide guidance in assessment, content, and teaching strategies need to accompany instructional materials for students. In addition, because school administrators must be cognizant of the demands placed upon teachers in the implementation of standards-based curricula, materials must include supporting information for school administrators.

Effective professional development materials are expected:

- enhance teacher content knowledge and investigative skills needed to utilize inquiry-based materials;
- to facilitate implementation of a standards-based curriculum in which assessment becomes pivotal to development of student learning;
- to address beliefs and attitudes (e.g., to value understanding over breadth of content);
- to view student thinking (e.g., prior knowledge and personal construction of meaning of the natural world) as central to the design of successful learning experiences for students;
- to incorporate information technology into effective teaching and student learning; and,
- to enhance teachers' ability to use student assessments for improving classroom instruction.

Factors Affecting Adoption and Implementation--In addition, the adoption and effective implementation of science instructional materials often is limited by financial and time constraints. Thus, the design of the materials should be sensitive to the following considerations:

- cost of instructional materials, requisite technology, and experimental supplies;
- cost and access to the requisite teacher professional development materials;
- demands placed on teacher workloads, including preparation and set-up time; and,
- physical constraints.

EVALUATION

Project evaluation should have three foci. First, the content of all instructional materials must be reviewed periodically by an external panel of scientists, teachers, and science educators, appointed by the Principal Investigator(s) and subject to NSF approval. This panel will ensure that the materials are assessment-driven, conform to the national standards, and include appropriate, up-to-date content, pedagogy, and assessments. The second type of evaluation involves a National Committee of Advisors, who will work with PIs across all of the projects to ensure a range of appropriate materials. Members of this Committee will be appointed by NSF in consultation with PIs, and will include scientists, educators and psychometricians.

Cooperation with both of these external evaluations is a requirement for continued funding. Third, each project will conduct its own evaluation of the efficacy of the instructional materials to promote standards-based teaching and to enhance student learning. This evaluation is articulated more fully under a subsequent description of the Proposal Narrative in the section, *Materials Evaluation*.

SUMMARY

The importance of a standards-based design, the guiding purpose of assessment in the design process, and the centrality of technology in student learning experiences need to be seriously addressed. It is expected that the prototype materials will be evaluated in pilot- and field-tests and that the efficacy of the curriculum materials and their design in enhancing student learning will be evident before Phase II proposals are received.

To meet the requirements in this solicitation, curriculum development teams need to include a broad range of expertise and include individuals with extensive backgrounds in science, science education, instructional materials development, information technology, teacher professional development, assessment, classroom teaching and evaluation.

References

American Association for the Advancement of Science, 1993. *Benchmarks for Science Literacy*. New York: Oxford University Press.

American Association for the Advancement of Science, 1989. *Science for All Americans: A Project 2061 Report on Literacy Goals in Science, Mathematics, and Technology*. New York: Oxford University Press.

Bransford, J. D., Brown, A. L., & Cocking R. R. (eds.), 1999. *How People Learn: Brain, Mind, Experience, and School*. Washington, D.C.: National Academy Press.

Elmore, R. 1997. *Learning from TIMSS – Results of the Third International Mathematics and Science Study*, Summary of a Symposium. Washington, D.C.: National Academy Press.

National Academy of Sciences, 1996. *National Science Education Standards*. Washington D.C.: National Academy Press.

National Assessment of Educational Progress, 1996. *Digest of Educational Statistics*. Washington D.C.: National Center for Educational Statistics, US Department of Education.

Third International Mathematics and Science Study (TIMSS) International Study Center, 1996. *Science Achievement in the Middle School*. Massachusetts: Boston College.

III. ELIGIBILITY INFORMATION

Proposals may be submitted by organizations with a scientific and/or educational mission. Among these are: colleges and universities, state and local education agencies, professional

societies, research laboratories, publishers of curricular materials, private foundations, and other public and private organizations whether for profit or non-profit. Group and collaborative proposals involving more than one institution must be submitted as a single administrative package from one of the institutions involved. Prospective applicants are strongly urged to contact the Program Officer listed at the end of this document for guidance.

IV. AWARD INFORMATION

Under this solicitation, a proposal may be submitted for any funding amount up to \$2 million for up to 3.5 years. NSF expects to fund approximately 3-5 awards, depending on the quality of submissions and the availability of funds. Anticipated date of awards is April 2001.

V. PROPOSAL PREPARATION & SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Proposals responding to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *Grant Proposal Guide* (GPG), NSF 00-2. The complete text of the GPG (including electronic forms) is available electronically on the NSF Web site at: <http://www.nsf.gov/>. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone 703-292-7827 or by e-mail from pubs@nsf.gov.

Proposers are required to prepare and submit all proposals for this program solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: <http://www.fastlane.nsf.gov/a1/newstan.htm>.

Proposers are reminded to identify the program solicitation number (NSF 00-80) in the program solicitation block on the NSF Form 1207, "*Cover Sheet for Proposal to the National Science Foundation*." Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

Preliminary Proposals. Submission of a preliminary proposal to this solicitation is required. **The deadline for submission of preliminary proposals is 5:00 PM, local time, July 14, 2000.** Staff recommendations are advisory and not binding and will be returned as expeditiously as possible, but no later than one month prior to the date for submission of a full proposal.

Preliminary Proposals should include the following FastLane forms:

- **Cover Sheet-** Be sure to check the preliminary proposal box on the cover sheet form.
- **Project Summary-** The section is limited to six pages (or equivalent) and should begin with a project abstract no longer than 100 words that describes the content and audience for

the project. The abstract should be followed by a project narrative that addresses the following topics: (1) goals or objectives of the project; (2) essential features of the project design, including content and pedagogical characteristics; (3) a workplan describing how goals will be achieved and a timeline for completion of deliverables; (4) evaluation plans (both formative evaluation to inform development of the project and summative to assess the impact of the project on the target audience); and, (5) dissemination plans. Page formats should be single spaced, with a clear and legible type size of no more than 12 characters per 2.5 cm, if using *constant spacing*, and no more than an average of 15 characters per 2.5 cm, if using *proportional spacing*.

- **Budgets-** Preliminary proposals should provide an estimated total budget to be requested from the Foundation with information, as appropriate, on salaries, equipment (where allowable), participant costs, consultant costs, travel, indirect costs, and cost-share from other sources, including any partners and their contribution. Within FastLane, enter the estimated total budget as Year 1. FastLane creates the cumulative budget automatically. Reviewers will be instructed to ignore the Year 1 budget.
- **Biographical Sketches-** Preliminary proposals should provide a brief narrative description (no more than two pages) of the relevant expertise of key personnel (e.g., educators, scientists, researchers, and evaluators). The biographical sketches should demonstrate expertise necessary to conduct the project.

Full Proposals. Proposals responding to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *Grant Proposal Guide* (GPG), NSF 00-2. The complete text of the GPG (including electronic forms) is available electronically on the NSF Web site at: <http://www.nsf.gov/>. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone 703-292-7827 or by e-mail from pubs@nsf.gov.

Proposal Narrative. The proposal narrative should present the following information that will be used to determine whether or not a grant will be awarded:

- **Goals and objectives--**Describe the project's goals and objectives, including a detailed description of the design process. Discuss the conceptual framework for the entire curriculum, as well as the objectives of the materials to be developed in Phase I (at least one semester).
- **Anticipated products--**Describe materials to be produced (e.g., workbooks, textbooks, software, videos, CD-ROMs, scholarly publications, monographs).
- **Need/content area--**Provide evidence that the proposed materials fill a need for students and teachers throughout the nation; indicate how they will be more effective than materials currently available to schools. The proposal should reference relevant literature to show knowledge of disciplinary and pedagogical issues. The proposer should describe how the instructional materials build on, and relate to, previous and on-going efforts in the field.

(A search of the Eisenhower National Clearinghouse (ENC) database is recommended. It may be found at: <http://enc.org/partners/fed/mfinder/nsf.htm>.)

- ***Content and pedagogical strategies***--Describe how the content and pedagogical strategies embedded in the materials are aligned with the National Science Education Standards; how the materials prepare and motivate students to continue study in science, mathematics, and technology (SMT) at higher grade levels; and how the materials account for potential differences in students' prior knowledge and experiences. The resources (e.g., computer expertise) needed at the school level to implement the materials should be delineated. The proposal should contain a detailed description of specific learning activities to be developed, including experiments, student projects, assessment materials, etc. Reviewers often find prototypes of materials to be useful in the review process; prototypes may be included in the appendices.
- ***Development process***--Explain how the materials will be created, reviewed, pilot-tested, field-tested, evaluated, and published. Materials must be pilot-tested in classes of master teachers, while field-test sites must include a broad range of teachers serving students with backgrounds representative of the nation's diversity. It is expected that results of these trials will inform revisions of the materials, as well as demonstrate their effectiveness. Results of these tests must be submitted to NSF as part of the annual reports and will be crucial in any proposal for Phase II. The proposal should contain a detailed plan of work, including a complete timeline. There must be an external panel of experts to review materials for content, pedagogy, and suitability for intended audiences. These reviewers will be selected in consultation with NSF.
- ***Parents, caregivers, and other community members***--Describe ways to communicate to the community how the materials are designed to improve learning of significant subject matter and to enhance student interest in science, mathematics, and technology, as well as to communicate to school administrators, implementation requirements. Attention should be given to communicating how the materials may be different from those with which community members are familiar.
- ***Assessment***--Describe tools and strategies for student assessment that will be included with the instructional materials. It is critical that student assessment be clearly aligned with stated student learning goals. Assessments should address both formative and summative aspects of learning. That is, there should be strategies for teachers to use in the process of instruction to determine what students are learning, as well as tools (e.g., tests, performance items) for teachers to use at the end of a substantive "unit" of instruction to determine the depth of students' learning. Development and validation of the assessment tools should occur within both the pilot- and field-testing parts of the

project. To the extent possible, alternative assessment strategies that are responsive to the different ways that students might communicate their understanding of the content should be included.

- **Professional Development**--Describe the assistance provided to teachers to support faithful and effective implementation of materials. This component should include teaching guides (e.g., print, CD-ROM, web-based) to accompany student materials, professional development materials, and other products.
- **Materials Evaluation**--The development of the instructional materials called for in this solicitation is assessment-driven. The assessment instruments measure the extent to which the learning goals have been achieved by students. Pilot- and field-test data that have been disaggregated by race/ethnicity or gender should include results of assessments associated with the materials as well as those from state or national assessments not directly connected to the materials. Ongoing internal evaluation by members of the project staff may be used to study the progress of the project as well as the efficacy of the materials in reaching project goals. Projects may wish to involve external evaluators in collecting, analyzing, and reporting results of both the pilot- and field-tests. Positive student achievement data is a prerequisite for Phase II funding.
- **Personnel**-- Describe the expertise and experience of key personnel. It is expected at a minimum that the development team should include scientists, science educators, information technology specialists, assessment and evaluation experts, and classroom teachers. The proposal should include a detailed description of the role and level of commitment of each of the key personnel.
- **Results of prior NSF support**--Describe the results of prior NSF support for education projects in which senior personnel have been involved. For projects that have developed materials that relate to the proposed work, the proposal must include a summary of the project evaluation that provides compelling evidence of the quality and effectiveness of the materials developed.

Budget. For this solicitation, NSF expects the majority of project costs to support personnel time and personnel-related costs; modest requests to support acquisition of materials, supplies, equipment, and computing services are allowable. Performers are expected to have the computing facilities, most of the equipment, and physical environment to achieve project goals. NSF will not fund purchase of classroom equipment for pilot- and field-testing instructional materials.

Final reports/materials submission. Two complete sets of deliverables are to be submitted to NSF along with a final report at the end of each Phase. In addition, at the end of Phase II, a final published copy of the curriculum and supporting materials must be submitted to the Eisenhower National Clearinghouse (ENC). At any time, NSF may request interim drafts of materials for review.

Cost-Sharing Requirements. Cost-sharing in the amount of 5 percent of the requested total amount of NSF funding is required for all proposals submitted in response to this solicitation. The proposed cost-sharing must be shown on line M on the proposal budget (NSF Form 1030.) Documentation of availability of cost-sharing must be included in the proposal.

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

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

B. Proposal Due Dates.

Preliminary proposals are required and must be submitted by July 14, 2000. Full proposals must be submitted via FastLane by 5:00 PM, local time, October 20, 2000.

A proposal may not be processed until the complete proposal (including the signed Cover Sheet) has been received by NSF. A proposal is considered complete when the proposal, including the Project Description, has been submitted to NSF. The receipt date will be the date the Sponsored Project Office transmits the proposal to NSF.

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

NSF 00-80
National Science Foundation
DIS-FastLane Cover Sheet
4201 Wilson Blvd.
Arlington, VA 22230

Appendices that cannot be submitted by FastLane should be mailed to the following address within five working days following proposal submission. All appendices must be clearly marked with a proposal number.

NSF 00-80
National Science Foundation
Ms. Geneane Grandy
Senior Program Assistant
4201 Wilson Blvd. Room 885
Arlington, VA 22230

C. FastLane Requirements.

Proposers are required to prepare and submit all proposals for this program solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: <https://www.fastlane.nsf.gov/al/newstan.htm>.

Submission of Signed Cover Sheets. The signed copy of the proposal Cover Sheet (NSF Form 1207) must be postmarked (or contain a legible proof of mailing date assigned by the carrier) within five days following proposal submission in accordance with the FastLane proposal preparation and submission instructions referenced above.

In order to use NSF FastLane to prepare and submit a proposal, the following are required:

Browser (must support multiple buttons and file upload)

- Netscape 3.0 or greater
- Microsoft Internet Explorer 4.01 or greater

PDF Reader (needed to view/print forms)

- Adobe Reader 3.0 or greater

PDF Generator (needed to create project description)

- Adobe Acrobat 3.01 or greater or
- Aladdin Ghostscript 6.0 or greater

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process.

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

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

What is the intellectual merit of the proposed activity?

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

What are the broader impacts of the proposed activity?

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

PIs should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both NSF merit review criteria. NSF staff will give these factors careful consideration in making funding decisions.

Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can

engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learner perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities

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

As elaboration to the above considerations, reviewers will also evaluate the extent to which proposals address the Design Requirements delineated in this solicitation.

B. Review Protocol and Associated Customer Service Standard.

All proposals are carefully reviewed by at least three persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this solicitation will be reviewed by panels of experts with SMT disciplinary and related education expertise.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. A Program Officer assigned to manage the proposal review will consider the advice of reviewers and will formulate a recommendation. NSF will be able to tell applicants whether their proposals have been declined or recommended for funding within six months for 95 percent of proposals. The time interval begins on the proposal deadline or target date or from the date of receipt, if deadlines or target dates are not used by the program. The interval ends when the Division Director accepts the Program Officer's recommendation.

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award.

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

B. Grant Award Conditions.

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

- These documents may be accessed electronically on NSF's Web site at: <http://www.nsf.gov/>. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone 703-292-7827 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, (NSF 95-26) available electronically on the NSF Web site. The GPM also is available in paper copy by subscription from the Superintendent of Documents, Government Printing Office, Washington, DC 20402. The GPM may be ordered through the GPO Web site at: <http://www.gpo.gov>. The telephone number at GPO for subscription information is 202-5102-1800.

C. Reporting Requirements.

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

Within 90 days after expiration of a grant, the PI also is required to submit a final project report. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF

review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

NSF has implemented a new electronic project reporting system, available through FastLane, which permits electronic submission and updating of project reports, including information on: project participants (individual and organizational); activities and findings; publications; and, other specific products and contributions. Reports will continue to be required annually and after the expiration of the grant, but PIs will not need to re-enter information previously provided, either with the proposal or in earlier updates using the electronic system. The project reporting system can be found at <http://www.fastlane.nsf.gov>.

D. New Awardee Information.

If the submitting organization has never received an NSF award, it is recommended that the organization's appropriate administrative officials become familiar with the policies and procedures in the *NSF Grant Policy Manual* which are applicable to most NSF awards. The "Prospective New Awardee Guide" (NSF 99-78) includes information on: Administrative and Management Information; Accounting System Requirements and Auditing Information; and Payments to Organizations with NSF Awards. This information will assist an organization in preparing documents that NSF requires for conducting administrative and financial reviews of an organization. The guide also serves as a means of highlighting the accountability requirements associated with Federal awards. This document is available electronically on NSF's Web site at: <http://www.nsf.gov/cgi-bin/getpub?nsf9978>.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries should be made to the **Instructional Materials Development program**, Dr. John Bradley, Section Head, Grades 7-12, Room 885, Division of Elementary, Secondary and Informal Education, National Science Foundation, Arlington, VA 22230, telephone 703-306-1614, e-mail: jbradley@nsf.gov. For questions related to use of FastLane, contact Mr. Jeff Harris, telephone 703-306-1620, e-mail: jsharris@nsf.gov.

IX. OTHER PROGRAMS OF INTEREST

The NSF Guide to Programs is a compilation of funding for research and education in science, mathematics, and engineering. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter. Many NSF programs offer announcements concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices listed in

Appendix A of the GPG. Any changes in NSF's fiscal year programs occurring after press time for the Guide to Programs will be announced in the NSF Bulletin, available monthly (except July and August), and in individual program announcements. The Bulletin is available electronically via the NSF Web Site at <http://www.nsf.gov>. The direct URL for recent issues of the Bulletin is <http://www.nsf.gov/od/lpa/news/publicat/bulletin/bulletin.htm>. Subscribers can also sign up for NSF's Custom News Service to find out what funding opportunities are available.

X. ABOUT THE NATIONAL SCIENCE FOUNDATION

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

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities, and persons with disabilities to compete fully in its programs. In accordance with federal statutes, regulations, and NSF policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF (unless otherwise specified in the eligibility requirements for a particular program).

Facilitation Awards for Scientists and Engineers with Disabilities (FASSED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the program announcement or contact the program coordinator at 703-306-1636.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation regarding NSF programs, employment, or general information. TDD may be accessed at 703-306-0090 or through FIRS on 1-800-877-8339.

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

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the review process; to applicant institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies needing information as part of the review process or in order to coordinate programs; and to another Federal agency, court or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Reports Clearance Officer; Information Dissemination Branch, DAS; National Science Foundation; Arlington, VA 22230.



The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Web Site at:

<http://www.nsf.gov>

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information (NSF Information Center):** (703) 292-5111
- **TDD (for the hearing-impaired)** (703) 292-5090 or (800) 281-8749
- **To Order Publications or Forms:**
 - Send an e-mail to: pubs@nsf.gov
 - or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111