Information Technology Experiences for Students and Teachers (ITEST)

Program Solicitation
NSF 02-147

National Science Foundation
Division of Elementary, Secondary and Informal Education
Directorate for Education and Human Resources

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

October 17, 2003
Required for Youth-Based Projects
Required for Comprehensive Projects for Students and Teachers

Resource Centers will not be funded in Fiscal Year 2004
(See **REVISIONS AND UPDATES**)

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

January 31, 2004
Youth Based Projects
Comprehensive Projects for Students and Teachers

REVISIONS AND UPDATES

This program solicitation was originally published on July 17, 2002, prior to Important Notice No. 128, "Revisions of the NSF Cost Sharing Policy," dated January 24, 2003. Cost sharing was not and is not required. In Section V.A., "Preliminary Proposals," in the Budget instructions, the phrase "with a clear indication of the percentage of that budget being sought from non-NSF funding sources" is being deleted; it is no longer required. Preliminary proposals will only be reviewed by NSF staff, and possible non-NSF funding will not be a factor in their evaluations. If a preliminary proposal has already been submitted with that information, it will not be considered auditable, and it will not increase or decrease the competitiveness of those preliminary proposals.

For the FY 2004 proposal cycle (Full Proposal Deadline of January 31, 2004), the Division of Elementary, Secondary, and Informal Education will not have funds available to support any new Resource Centers. Proposals submitted for this component will be returned without review.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Information Technology Experiences for Students and Teachers (ITEST)

Synopsis of Program:

ITEST is designed to increase the opportunities for students and teachers to learn about, experience, and use information technologies within the context of science, technology, engineering, and mathematics (STEM), including Information Technology (IT) courses. It is in direct response to the concern about shortages of technology workers in the United States and builds on the earlier NSF program for youth entitled *After School Centers for Exploration and New Discovery* (ASCEND). Supported projects are intended to provide opportunities for both school-age children and for teachers to build the skills and knowledge needed to advance their study, and to function and contribute in a technologically rich society.

ITEST has three components: (a) youth-based projects with strong emphases on career and educational paths; (b) comprehensive projects for students and teachers; and (c) Resource Center(s) that engage in research related to funded projects, provide technical support and have responsibilities for national dissemination of project models, instructional materials, and best practices.

This solicitation complements and is not intended to overlap with Advanced Technological Education (ATE) program described in Section I. Information Technology (IT) is within the scope of the ATE program, so proposals for the development of IT classroom materials for students or teachers, or for professional development of IT teachers in support of technical careers, should be submitted to the ATE program.

Cognizant Program Officer(s):

- Umesh Thakkar, Lead Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5094, email: uthakkar@nsf.gov

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

- 47.076 --- Education and Human Resources

Eligibility Information

- **Organization Limit:** None Specified.
- **PI Eligibility Limit:** An individual may serve as the Principal Investigator (PI) for no more than one proposal per round of competition. Any exceptions must be approved of, in writing, by Barry Van Deman, Section Head, Public Understanding of Science (e-mail: bvandema@nsf.gov) prior to submitting a proposal.
- **Limit on Number of Proposals:** None Specified.

Award Information

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 20 to 25
- **Anticipated Funding Amount:** $15,000,000 Approximately $15 million per competition, pending availability of funds.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

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

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required.
- **Indirect Cost (F&A) Limitations:** Not Applicable.
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

- **Preliminary Proposals *(required)* :**
  October 17, 2003
  Required for Youth-Based Projects
  Required for Comprehensive Projects for Students and Teachers

  Resource Centers will not be funded in Fiscal Year 2004
  (See **REVISIONS AND UPDATES**)

- **Full Proposal Deadline Date(s)** (due by 5 p.m. proposer's local time):
  January 31, 2004
  Youth Based Projects
  Comprehensive Projects for Students and Teachers

Proposal Review Information

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

Award Administration Information

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

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I. INTRODUCTION

A. Division of Elementary, Secondary, and Informal Education

Goals and Objectives: Science, technology, engineering, and mathematics (STEM) education, pre-Kindergarten through grade 12 (preK-12), lays the foundation of knowledge and skills needed by future researchers, educators, and technologists; students pursuing post-secondary education in other disciplines; and individuals directly entering the technological workforce. The Division of Elementary, Secondary, and Informal Education (ESIE) supports the National Science Foundation's mission of providing leadership and promoting development of the infrastructure and resources needed to improve preK-12 STEM education throughout the United States.

ESIE's comprehensive and coherent, research-based program portfolio develops the nation's capacity to support high-quality STEM education. Innovative instructional materials and student assessments, as well as new models for the delivery of teacher professional development, contribute to STEM classroom environments that enable all students to achieve their full potential. Moreover, ESIE's informal learning opportunities via media, exhibit, and community-based programs increase scientific and technological literacy, as well as develop life-long learning skills that benefit students of all ages. All ESIE programs contribute to development of a knowledge base that informs practice and of partnerships that leverage expertise and other resources of major education stakeholders nationwide, including higher education, state and local education agencies, school districts, informal science education institutions, and industry.

Program Overviews. Programs administered by ESIE include:

- **Instructional Materials Development (IMD)** -- IMD develops high-quality, research-based instructional and assessment materials that enhance knowledge, thinking skills, and problem-solving abilities of all students, as well as incorporate recent advances in disciplinary content, research on teaching and learning, and instructional technologies. IMD materials are intended to be implemented nationwide and address learning in diverse settings.

- **Teacher Enhancement (TE)** -- TE develops models for strengthening skills of the teacher workforce by expanding and deepening their understanding of content, pedagogy, and instructional technologies; by heightening awareness and deepening understanding of the diverse learning needs of students; by grounding continued professional development in the context of school structure and organization; and by developing a cadre of teachers and administrators who can effectively lead the reform of STEM education.
- **Centers for Learning and Teaching (CLT)** -- CLT focuses on the advanced preparation and professional development of STEM practitioners and educators, as well as establishment of complex, meaningful partnerships among education stakeholders, especially Ph.D.-granting institutions, school systems, and informal education performers. Program goals are to rebuild and diversify the national infrastructure for STEM education; to increase the number of K-16 educators capable of delivering high-quality content, instruction, and assessment; and to provide substantive research opportunities into the nature of learning, teaching strategies, and education reform policies and outcomes.
- **Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST)** -- PAEMST, administered on behalf of the White House, recognizes exemplary careers of elementary and secondary teachers of mathematics and science.
- **Informal Science Education (ISE)** -- ISE provides stimulating experiences for STEM learning outside of formal classroom environments through media, exhibits, and community-based programming. Its goals are to increase understanding of, and participation in, STEM disciplines by individuals of all ages; to establish linkages between informal and formal education; and to stimulate parents and others to support their children's STEM learning endeavors and become informed proponents for high-quality, universally available STEM education.
- **Advanced Technological Education (ATE)** -- Jointly managed by the Division of Undergraduate Education (DUE) and ESIE, ATE promotes improvement in technological education at the undergraduate and secondary school levels by supporting curriculum development; preparation and professional development of college faculty and secondary school teachers; internships and field experiences for faculty, teachers, and students; and other activities. With an emphasis on two-year colleges, the program focuses on the education of technicians for the high-technology fields that drive our nation's economy.

ESIE has identified three issues that should be integrated, as appropriate, into funded projects across its programs:

- **Evaluation** -- ESIE has a strong commitment to evaluation that assesses the effectiveness and impact of its projects in enhancing learning and instruction in STEM disciplines in both formal and informal education settings. All projects should contribute to strengthening knowledge of effective processes.
- **Instructional Technology** -- Projects should capitalize on educational technologies and electronic networking in the development of materials, instructional strategies, and professional development in a manner that uses the technology thoughtfully and ensures accessibility to quality education for all students.
- **Promoting Diversity in STEM Education and Careers** -- All ESIE programs have the goal of increasing access, participation, and success of women, underrepresented minorities, and persons with disabilities in STEM education. ESIE is particularly interested in increasing the numbers of such students who will pursue advanced study and careers in STEM areas, including the teaching of science, technology, and mathematics, grades K-12.

ESIE programs are described in separate program solicitations. Updates may be issued, as needed, to announce relevant changes or additions. To stay current with ESIE program offerings, periodically visit the ESIE Web site, http://www.ehr.nsf.gov/ehr/esie/.

For information regarding ATE, please visit the DUE Web site, http://www.ehr.nsf.gov/ehr/due/.

All NSF publications referenced in this document are available via the NSF Online Document System, http://www.nsf.gov/cgi-bin/pubsys/browser/odbrowse.pl.

B. ITEST Program

Program Overview. *Fluency with information technology entails a process of lifelong learning in which individuals continually apply what they know to adapt to change and acquire more knowledge to be more effective in applying*

information technology to their work and personal lives (National Academy of Sciences, 1999).

This solicitation seeks to increase the opportunities for students and teachers to learn about, experience, and use information technologies within the context of science, technology, engineering, and mathematics (STEM), including Information Technology (IT) courses. It is in direct response to the concern about shortages of technology workers in the United States and builds on the earlier NSF program for youth entitled *After School Centers for Exploration and New Discovery* (ASCEND). Supported projects are intended to provide opportunities for both school-age children and for teachers to build the skills and knowledge needed to advance their study, and to function and contribute in a technologically rich society.

ITEST has three components: (a) youth-based projects with strong emphases on career and educational paths; (b) comprehensive projects for students and teachers; and (c) Resource Center(s) that engage in research related to funded projects, provide technical support for ITEST projects, and have responsibilities for national dissemination of project models, instructional materials, and best practices.

Any proposal submitted for youth-based or comprehensive projects should include the critical workforce skills. These are described by the Secretary's Commission on Achieving Necessary Skills (SCANS) of the U.S. Department of Labor in *What Work Requires of Schools: A SCANS Report for America 2000* (U.S. Department of Labor, 1991) and include skills such as computation and literacy, and the ability to apply this knowledge; working habits, such as the ability to work on teams; solving complex problems in systems; and the understanding and use of technology.

1) Youth-Based Projects

ITEST will support year-round, youth-based projects that include a summer component. Projects should include activities (after-school and/or weekends) that focus on IT or IT-intensive STEM subject areas. Projects may include the creation of new instructional materials or may adopt or adapt existing curriculum materials and tools, including software, for use in an informal science education environment. Creation of innovative and creative models for engaging students in meaningful learning experiences is a priority. For the purposes of ITEST, the definition of informal learning is that it is voluntary, and primarily self-directed and independent learning.

Projects must be of high quality and use equally high quality materials to engage middle- and high-school students. Single-event, short-term workshops and camps alone are not sufficient; rather, projects of two-or-more year duration are sought that address the developmental needs of youth, while exposing participants to the workplace and workplace skills. Parental involvement and college preparatory support are also essential *(Raising Minority Academic Achievement: A Compendium of Education Programs and Practices, American Youth Policy Forum, 2001).*

2) Comprehensive Projects for Students and Teachers

ITEST will support projects that adopt, adapt, or infuse appropriate information technologies into STEM courses that are commonly available in schools. Development of teacher materials on information technologies is encouraged, whether linked to core STEM courses or providing a broader range of resources and applications. Provision of opportunities for teachers to put into practice what they have learned via summer laboratory experiences with students, grades 7-12, is expected.

For schools to support growing competence in information technology among students, teachers themselves must become fluent with technical tools and resources that could support their teaching priorities. Because it is unlikely that many schools would introduce additional courses to the already crowded list of existing offerings, the focus of this component is on technologies that would support learning and teaching within the context of the core curriculum.

3) Resource Centers

ITEST anticipates funding Resource Centers in order to support the projects in their work, and to engage in research that can be used to inform and improve IT experiences in both formal and informal education venues.

Projects will need support in developing appropriate models, in identifying the relevant research, and in designing activities to achieve the outcomes anticipated by the program. Resource Centers will gather and synthesize relevant literature and make it available to projects. They will also maintain materials and lesson banks of what is used and developed by each project and conduct research on affective and cognitive learning and teaching practices related to IT. The Centers will support communication among ITEST Principal Investigators by organizing annual meetings and fostering other means of communication, such as list serves and web pages. Lastly, Resource Centers will assist projects with the dissemination of materials, as well as the outcomes and research findings of the ITEST program.

Rationale. Information Technology (IT) -- defined to include computer hardware, software, and communications networks, as well as technology interfaces and human-computer interfaces -- is the fastest growing occupational sector in the country. The U.S. Department of Labor's official employment projections for 2000-2010 predict an increase of 75% - or a growth of 1.6 million - in IT jobs that normally require a Bachelor's degree or higher, in contrast to a growth rate of 15.2% for all occupations (*Hecker, 2001*). Even though there is a need to increase the number of individuals with the skills necessary to enter the IT workforce, there are segments of the population that are severely underrepresented in IT occupations. The number of minorities and women pursuing computer science degrees has declined considerably in the last twenty years (*Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development, September 2000*). Black and Hispanic Americans represent less than 10% of the computer systems analysts and scientists, and less than 10% of computer programmers (*U.S. Department of Commerce, Office of Technology Policy, 1998*). The demand for IT workers as a whole can be met only if the needs to diversify the IT workforce and encourage underrepresented groups to pursue careers in IT and IT-intensive fields are addressed.

Because of the proven success enrichment programs have in increasing student interest, the Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development recommends that these programs be made available to all students. Increasing interest alone is not sufficient, however, because many other factors are needed to *sustain* interest and aid youth in making often-difficult transitions from middle school to high school, and high school to college. It is anticipated that the ITEST program will not only increase interest in IT through the creation of effective student education programs, but also maintain interest through supportive activities that include parental involvement, career exploration, externships, research, and multi-year programs.

Teachers are also a key factor in providing IT fluency for all. Teachers consistently report that they have difficulty finding appropriate uses and applications for the Internet, which has penetrated every aspect of society--school, homes, and workplace, and which has fueled current interest in IT. How teachers use these technologies has been described in a number of recent reports. For instance, a recent study indicates that approximately 85% of middle- and high-school students report that they use a computer in school (*National Telecommunication and Information Administration, 2002*). Home use, however, drops precipitously, from 83% to 28%, as household income drops. Ethnic differences are also pronounced. For example, home use by Hispanic and Black Americans is just over one-half of what it is for Asian, Pacific Islander, and White Americans.

Symptomatic of how technology is used, recent reports show that approximately one-half of the public school teachers who have computers or Internet access report that they use them for classroom instruction. The National Center for Education Statistics reports that these technologies are used more often in schools with small minority populations and low levels of poverty, and that this does not depend on the availability of the technology in the schools. Among those teachers with access at home, those with *less* classroom experience are *more* inclined to use the Internet for planning lessons, creating instructional materials, and accessing model lesson plans. Teacher preparation to use computers comes from (in descending order) independent learning, professional development, and colleagues. Over a three-year period, three-fourths of the surveyed teachers participated in 32 hours or more of training on computers or the Internet. (*National Center for Education Statistics, September 2000*). Clearly, there is a need to increase opportunities for teachers and students to build on their knowledge of IT, as well as the many applications of this discipline, both inside and outside of the classroom.

The shortage of underrepresented Americans in the technological workforce contributes to the overall shortage of information technology workers. Current structures and approaches have resulted in a well-documented digital divide, illustrated by how computers are used in schools and their availability in the home. "Although computing is integrally linked to critical investigations in medicine, environmental science, famine control, art, and music, computer science textbooks focus primarily on technical detail, with little attention paid to the application and impact of the technology in meaningful interdisciplinary

problem-solving assignment" (*Margolis, 2002*). In order to address the long-term need for Information Technology workers, programming for both youth-based and teacher projects is needed.

II. PROGRAM DESCRIPTION

A. Youth-Based Projects

1) *Project Goals*

The goal of ITEST youth-based programming is to provide middle- and high-school students, particularly those from disadvantaged urban and rural communities, access to year-round IT enrichment experiences and opportunities to explore related education and career paths. Projects should create high-quality learning strategies and curriculum models for use in after school, weekend, and/or summer settings. Youth-based projects should include hands-on, inquiry-based activities with a strong emphasis on non-traditional approaches to learning. Cooperative learning and socially relevant problem solving are alternatives to consider. Successful ITEST proposals for youth-based projects would include the following:

- Intensive, year-round enrichment experiences that emphasize IT or IT-intensive STEM subject areas for middle- and high-school students (grades 7-12). Projects should offer a minimum of 120 contact hours per year, with summers being used for participation in research institutes, externships, or other field-based experiences.

- The creation of a student-based model tailored to meet the needs of informal learners. Projects should provide in-depth learning opportunities for students in IT or an IT-intensive subject area. Proposals may include the development of new materials or the modification of existing instructional materials for use in informal settings.

- A focus on IT or an IT-intensive science, mathematics, engineering, or technology subject area. Proposals should include a description of how the content will be aligned with appropriate national or state standards. Examples include, but are not limited to, computer information systems, cryptography, robotics, astronomy, biotechnology, Web site design, computer-aided instruction, and human-computer interface design.

- Evidence of public/private partnerships to enhance resources and exposure to careers in science and technology. Collaborations and partnerships between informal science education institutions, business/industry, community organizations, community colleges, and universities are encouraged to enhance the overall project scope and/or the ability to serve participants effectively. Such partnerships should provide participants with opportunities to work directly with IT and STEM professionals and to see examples of workplace applications.

2) *Project Characteristics*

Current IT standards for schools focus primarily on the use of computers and the associated software as tools. Such projects generally include the basics associated with computer hardware, software, and popular applications such as word processing, database design and management, spreadsheets, desktop publishing, presentation software, and various Internet functions such as e-mail and information retrieval. ITEST projects must go beyond these basics and introduce

fundamental concepts of IT such as algorithms, data organization, modeling, and abstraction, as well as some of the more exciting applications of IT that might be inaccessible to students in a home or school environment. For example, Web page design, 2-D animation, and multimedia authoring are all specialized skill areas in IT. Cryptography and astronomy are examples of IT-intensive applications drawn from the mathematical and physical sciences. The goal is not to duplicate or extend formal education classes, but to capitalize on the strength of voluntary, self-directed, and exploratory learning, while introducing content in a novel manner.

a. Focus. All projects should focus specifically on IT or IT-intensive STEM subject areas and clearly show the relevance of the proposed work to learning and acquiring IT concepts and skills. If the project is focused on one technology, such as robotics, the proposal should show how, through this focus, participants would learn IT skills and STEM concepts.

b. Project Design. ITEST will support year-round projects that take place after school and on weekends. All projects must include a summer component. The project design should allow for in-depth exploration of content and provide participants with an opportunity to meet and work with scientists and professionals in IT/STEM fields, preferably in externships or intensive summer institutes allowing for hands-on experiences. Activities should be designed to meet the needs of the target audience of middle- or high-school students, currently in or entering grades 7-12. Guidance on preparation for college, school-to-work training, and parental involvement are all key elements of the ITEST project design. Proposals should describe a recruitment plan, which outlines strategies for recruiting and retaining participating youth. Each project is expected to develop an informative Web site that represents the work of the project and will be compatible with the ITEST homepage created by the Resource Centers.

c. Lead Institution. All institutions with an educational mission are eligible. Such institutions include, but are not limited to, two- and four-year colleges and universities, businesses, informal science education institutions, professional societies, middle and secondary schools, and community agencies. Additionally, the ITEST program emphasizes the role that informal learning can have in influencing and nurturing interest in IT. Informal science education institutions include museums, science and technology centers, botanical gardens, zoos, and aquariums. These institutions already provide creative examples of IT applications in exhibitions, programs, research, and administration. They are expected to be excellent resources for program design and management, and often have longstanding relationships with schools and community-based organizations.

d. Partners and Collaborative Relationships. Because considerable emphasis is placed on providing students with guidance on academics, as well as college preparation and school-to-work transitions, it is also expected that the lead institution and/or partners will include two-year colleges, universities, businesses, industry or community-based organizations, as appropriate, to provide content expertise, externships, and research experiences for participants.

e. Impact. Projects may have a local or regional focus (either a community or metropolitan area), and should provide a plan for year-round activities in which content is introduced in an engaging manner.

f. Evaluation. The proposal must include plans for formative and summative evaluation of the project to assess the impact of the project's activities, progress, and success in meeting goals. Evaluations must develop indicators of impact on students and how well the project promotes diversity among participants. The evaluation plan must describe how the data will be collected, indicators that will be measured, methods of analysis, and the timeline for the evaluation process. If materials are developed, appropriate plans for evaluation and field-testing of materials should be included. Each project must commit to cooperating with an NSF third-party evaluation of the impact of ITEST that will be conducted. As part of this evaluation, Youth-Based Projects will be responsible for providing requested data to the program evaluator.

g. Institutionalization. Proposals should include plans for ensuring continuation of critical aspects of the project after the period of NSF support.

B. Comprehensive Projects for Students and Teachers

1) ***Project Goals***

The goal of Comprehensive Projects for Students and Teachers is to provide intensive teacher professional development in IT concepts, skills, and applications; pedagogical strategies that promote student investigation and inquiry; and awareness of IT career and educational paths for students. The inclusion of guidance counselors to assist with the development and dissemination of IT-related career materials is encouraged. This component will create opportunities for teachers to put into practice what they have learned via summer laboratory experiences with students in grades 7-12. Additionally, projects should provide visible and transferable models of the effective use of IT by teachers in classrooms.

Information technology addresses how information is acquired and modeled, as well as how understanding can emerge. Understanding IT concepts and mastering IT skills are just part of what is needed to enhance intellectual capabilities. Successful ITEST proposals for teacher projects should include the following:

- A minimum of 120 contact hours per year for teachers, which must include summer and school year activities. Whenever possible, continuing education or graduate credit should be arranged for participating teachers.

- A description of the fundamental components (concepts and skills), as well as the intellectual capabilities, that the project intends to enable in participants.

- A clear description of the end goals (what participants will know or be able to do as a result of the project) within the broader goals of the program (more people competent in IT and pursuing careers that include IT components). The strategies used, such as workshops, supporting materials, collaborations, and so forth, should be logically tied to the project goals.

- Pedagogical strategies that promote inclusion so all participants will learn "to apply information technology in sophisticated ways to solve problems across disciplines and subject areas…" (*American Association of University Women, 2000*). Successful projects should embrace approaches and methodologies that attract, encourage, and support those students and classrooms (through their teachers) that have benefited least from the advent of information technologies. Attention must be given to recruitment, content, and context when designing strategies to reach those teachers.

- A summer youth component where the participating teachers can pilot new ideas and strategies.

- An evaluation that measures how well the goals were met and provides opportunity for appropriate assessment and adjustment as the project progresses.

2) ***Project Characteristics***

Proposed projects should include summer institutes that provide intensive teacher professional development in information technology and related STEM content domains. They should emphasize pedagogical strategies that address the needs of students, as well as diverse learning styles and facility within IT and increased student investigation and inquiry. Part of the experience should make teachers aware of related career and educational paths for students through direct interactions with practitioners. Projects should also provide opportunities for teachers to put into practice what they have learned with grades 7-12 students in summer institutes and in their STEM courses. Thus, projects should include both teacher enhancement and a summer institute for students. The student summer activities should be led by participating teachers with support from faculty or partner mentors. Although all of the proposed projects will include summer activities, the total programming experience is expected to be year-round in nature.

a. Focus. Appropriate themes are those that will directly lead to teaching that focuses on IT and incorporates it into STEM courses. Examples of IT supporting content domains include computation science or computational mathematics, cryptography, Geographical Information System/Global Positioning System, bioinfomatics, robotics, and computer graphics. Since it is expected that teachers will use what they learn when they return to their schools, it is expected that projects will show the need for, and curricular relevance of, what is proposed.

b. Project Design. The activities, both for teachers and students, should use methodologies that are consistent with the intent of the project, to move more students to consider technology-intensive career paths. Consequently, such workshops should support and use investigation, collaboration, technical resources, and other techniques that are part of the accepted way workers use technology. Moreover, IT should be an integral part of methodology and delivery of the summer and year-round activities of the project.

A necessary part of the project is to continue to support teachers after they return to their classrooms. The method of this support is left to the project, but might include using mentors; providing collaborative groups for reflection, visits, and follow-up meetings; online sharing; access to expanding teacher collections of activities and comments; and so forth. The full potential of IT should be exploited as a method of providing long-term support. Each project is expected to develop an informative Web site that represents the work of the project and will be compatible with the ITEST homepage created by the Resource Centers.

c. Recruitment. Recruiting should be consistent with the project goals. For instance, if the project focuses on computational chemistry, the need in terms of helping students understand key chemistry concepts should be substantiated and the recruitment and ongoing support for the teachers and classrooms should be appropriate. Projects that reach communities with fewer opportunities and have a clear plan to increase the diversity of the IT workforce are particularly encouraged.

d. Evaluation. The proposal must include plans for formative and summative evaluation of the project to assess the impact of the project's activities. For teachers, it is expected that both what they teach (the infusion of IT in STEM courses) and how they teach (access resources, supporting models, etc.) will change. The evaluation plan must therefore be multidimensional. In addition to determining the immediate results of the in-service activity or student workshops, the evaluation should determine if teaching practice in the school has changed in ways that are promoted by the project. If curriculum materials or modules are developed, appropriate evaluation and field-testing of prototypes should be included.

Each project must commit to cooperating with an NSF third-party evaluation of the impact of ITEST that will be funded independently by NSF. As part of this evaluation, Comprehensive Projects for Students and Teachers will be responsible for providing requested data to the program evaluator.

e. Other. Projects can also support the development of (a) appropriate instructional modules and other materials for use by students, including those that promote an awareness of IT-careers, and (b) professional development materials for use by teachers. Given the modest size of the ITEST program, these materials will be limited to small modules used to augment STEM courses.

C. ITEST Resource Centers

1) *Goals*

Up to two Resource Centers will be funded to provide technical support for ITEST projects. It is anticipated that Resource Centers will engage in research related to funded projects and have responsibility for national dissemination of program models, materials, and best practices. While it is expected that one Center will focus on youth-based projects and the other on the comprehensive projects, proposals for one comprehensive Center that serves both the teacher and youth-based projects will also be considered.

2) *Characteristics*

Proposals for ITEST Resource Centers are expected to engage in technical support for grantees, research, and dissemination activities. It is also anticipated that projects will reflect exemplary application of IT to the function of the Center itself. As noted previously, consideration will be given to funding one Center that has the expertise in both Youth-Based Programs and Comprehensive Programs for Teachers and Students.

a. Lead Institution. It is anticipated that the lead institution for the ITEST Resource Centers will be a service-oriented educational research and development organization or an institute of higher education with demonstrated capacity to plan, develop, and manage a national Center that provides technical support for a diverse portfolio of ITEST projects across the United States. The institution should have thorough knowledge of the targeted program areas of informal science education and/or teacher professional development. Finally, it is expected that the lead institution will have expert knowledge of IT applications and the needs that the ITEST program is designed to address.

b. Technical Support. Resource Centers are expected to provide technical support for the ITEST projects. This may include, but is not limited to, organizing and holding meetings, and identifying resources -- including print and electronic -- and professionals in the field that may augment or enhance projects in meeting their goals. In addition, the Resource Centers are expected to support discussions, provide supporting materials to projects, and disseminate ideas and materials from the projects to the field.

c. Research and Evaluation. Resource Centers are expected to engage in research on the ITEST program. Centers are tasked with developing a research plan that will address student learning in formal and informal settings, teaching practice and the integration of IT into STEM courses, and youth-based programming. Assessment of best practices in youth enrichment programs, non-traditional learning approaches, and issues of equity and diversity in IT are also appropriate. Each project will have its own individual evaluation plan and participate in a comprehensive program evaluation that will be conducted by a third party evaluator funded independently by NSF.

d. Dissemination. Lastly, Resource Centers are expected to have major responsibility for the dissemination of project findings to the field. In addition to submitting a comprehensive report to NSF, the project should include a plan for dissemination of findings to both formal and informal science education professionals.

D. REFERENCES

American Association of University Women (2000). *Tech-Savvy: Educating Girls in the New Computer Age*. Washington, DC.

Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development (September 2000). *Land of Plenty, Diversity as America's Competitive Edge in Science, Engineering and Technology.* Washington, DC.

Hecker, Daniel E. (November 2001). *Occupational Employment Projections to 2001*, Monthly Labor Review, pp.57-58.

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III. ELIGIBILITY INFORMATION

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

IV. AWARD INFORMATION

Duration and Funding Level. Project duration for both Youth-Based Projects and Comprehensive Projects for Students and Teachers is expected to be 2-3 years. The funding level for Youth-Based Projects is up to $300,000 annually, while Comprehensive Projects for Students and Teachers will be funded for up to $400,000 annually. The Resource Center(s) will be funded for 4 years for a maximum of $2 million. Proposals for a single Resource Center that will serve both Youth-Based Projects and Comprehensive Projects for Students and Teachers may be funded at a higher level.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals *(required):*

A preliminary proposal and an ITEST program staff response are required prior to the submission of a full proposal for a project grant. **Preliminary proposals are required for Youth Based projects and Comprehensive Projects for Students and Teachers. Resource Centers will not be funded in Fiscal Year 2004** (see **REVISIONS AND UPDATES** at the beginning of this solicitation). A PI should submit a preliminary proposal as early as possible before the due date in order to ensure adequate time to obtain staff reviews that will provide input for developing a full proposal. Preliminary proposals must be submitted in FastLane no later than 5:00 PM local time on the due date. (In FastLane the preliminary proposal is termed preproposal.)

Cover Sheet: Be sure to check the preproposal box.

Project Summary: A 100-word abstract that clearly identifies the major features of the project.

Project Description: The narrative is limited to six pages in length. It should sketch, in broad strokes, the essential features of the project including:

Need: Describe the need being met (the educational, not institutional, need), the target population, and the plan to reach that population.

Goals: Describe the major goal(s) of the project, anticipated outcomes, and their alignment with ITEST program goals.

Description of the Activity: Describe the design of the project, identifying major components and including a timeline. What is the proposed life span of the project/activity? Provide general information on the content area, target population, and number of students and/or teachers to be impacted. When appropriate, indicate how the activity will be sustained following the NSF-funded period.

Evaluation: Plans for evaluation, including formative and summative, as appropriate.

Key Personnel: Identify each key staff member, consultant, and/or advisor involved in the project, and provide a one-sentence description of the qualifications for each and the percentage of time that person will devote to the project.

Dissemination & Supplemental Materials: Describe plans for the broad dissemination of the products of the project, as appropriate. Describe any planned ancillary materials that are to be made available to the general public.

Budget: Present a projected total budget with clear indication of the percentage of that budget being sought from non-NSF funding sources; and an indication of how project efforts will be sustained after an NSF-award period, if applicable. The budget should be entered as the Year 1 budget in FastLane. A one-page narrative budget explanation should be included in the Budget Justification.

Supplemental Materials: These are NOT permitted for preliminary proposals.

Full Proposal Instructions:

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

Full proposals must be submitted via FastLane no later than 5:00 PM local time on the specified deadline date. Submission of full proposals via FastLane requires completion of the following FastLane forms:

Cover Sheet. (See GPG, Chapter II, Section C). The Cover Sheet must contain all requested information. If project funds are requested from another Federal agency or another NSF program, it must be indicated on the cover sheet. If such funds are requested subsequent to proposal submission, a letter should be sent to the attention of the ITEST program, identifying the proposal by its NSF number. Proposers are reminded to identify the program solicitation number in the program announcement/solicitation block on the *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. The related preliminary proposal number must be entered on the cover page as well.

The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications. The AOR must provide the required certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Web site at: http://www.fastlane.nsf.gov.

Project Summary: A one-page (250 word) Project Summary should be prepared, suitable for publication, which presents a self-contained description of the activity that would result if the proposal were funded. The initial sentences should describe the ITEST program component to which the proposal is submitted, content area, targeted participant population(s), the number of participants (students and/or teachers), and the number of contact hours for each group. The summary should be written in the third person, the present tense, and include an indication of the need being addressed, a statement of objectives, methods to be employed, potential contribution to the public understanding of STEM or the outcomes resulting from the project.

Table of Contents: (See GPG, Chapter II, Section C.2). The *Table of Contents* is automatically generated in FastLane.

Project Description: (including results from prior NSF support and data sheet). (See GPG, Chapter II, Section C.3) Most of the information that determines whether or not a grant will be awarded is included in the Project Description. Reviewers will use this information in judging the merit of the proposal as described in this document. The maximum number of pages allowable for the *Project Description* is 15 pages. Page format should be single-spaced with a clear and legible type size of not smaller than 12-point type and with no less than 2.5 cm margins on all sides.

Results from Prior Support: (See GPG, Chapter ll, Section C.3). If the prospective PI or CoPI(s) received support for related NSF activities within the past five years, a 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, funding 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). Evaluation data should be clearly described. Details regarding evaluation data should be put into an appendix. PIs must have submitted a final report for any completed NSF-funded project, or no new grant may be awarded.

The narrative section of a general ITEST project proposal should include a project overview, goals and objectives, general project description, qualifications of key personnel who will be coordinating the project, anticipated results, and evaluation and dissemination plans. Substantive information essential to understanding the details of complex projects should be placed in appendices with explicit references in the narrative.

References Cited: (See GPG, Chapter II, Section C.4). Any literature cited should be specifically related to the proposed project, and the Project Description should make clear how each reference has played a role in the motivation for, or design of, the project.

Biographical Sketches: (See GPG, Chapter II Section C.5). Biographical information (no more that two pages) must be provided for each senior person listed on the budget forms, including consultants, and advisors. Include career and academic credentials, as well as e-mail and mailing address.

Current and Pending Support Form: (See GPG, Chapter II, Section C.7).

Supplementary Documents: (See GPG, Chapter II, Section C.9). Reviewers are often asked to read and assess a substantial number of competing proposals. For this reason, the project 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 that are clearly referenced in the proposal. Additionally, the proposal may refer to Web sites that contain this type of supplementary material. Presentation of such materials should be thoughtful and concise. Supplementary materials that cannot be submitted electronically must be mailed directly to the ITEST program. Twelve copies of any ancillary materials are required. NSF does not require reviewers to read appendices.

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Competitive ITEST Project Description includes the following:

- **Statement of Need**: This should be stated in terms of the educational need, not the institution's need.
- **Target Audience and Impact**: Specify the intended primary audience and if the impact will be local or regional.
- **Project Goals:** State the project goals in terms of the intended impact on the target audience.
- **Focus:** See **Characteristics** under Youth-Based Projects and Comprehensive Projects for Students and Teachers.
- **Project Design**: Describe the overall approach and components of the project. Discuss the scope and depth of the science, and the manner and style in which it will be presented. What is the target audience's expected experience as they participate in the project? What are the project deliverables?
- **Recruitment:** Provide an appropriate recruitment strategy for the target audience; also see **Characteristics** under Youth-Based Projects and Comprehensive Projects for Students and Teachers.
- **Key Staff, Consultants, and Advisors**: Provide a description of the responsibilities, qualifications, and level of effort of the key personnel involved in the project, including the role of consultants and advisors at each stage of project.
- **Partners:** Provide documentation of collaborative relationships and partnerships that are essential to the project.
- **Ancillary Material.** Describe any ancillary material that will be produced.
- **Evaluation:** It is expected that ITEST projects will include, at a minimum, two stages of evaluation at a level commensurate with the nature and scope of the propose project. Elements to be addressed in the Evaluation Section of a Proposal:
- Name, credentials, and responsibilities of the evaluator/s.
- Strategies used for the various phases of the project.
- General information about the evaluation processes including sample sizes, instruments used, nature of the data (quantitative and qualitative), and analytical methods.
- Timeline: When, during the various phases of the project, will the evaluation work take place? Be sure to allot adequate time for all phases including an adequate and thorough summative evaluation.
- Budget: The budget should be adequate to enable the evaluator to conduct a thorough project evaluation.

- **Dissemination:** Describe, as appropriate, how information about the project and any knowledge gained in developing the project will be conveyed to the field.

- **Timeline:** Provide a month-by-month schedule for each year of the project that indicates the major developmental steps for all the aspects of the project.

- **Sustainability:** Describe the plans to sustain the project efforts beyond the period of the grant, as appropriate.

Proposers are reminded to identify the program announcement/solicitation number (02-147) in the program announcement/ solicitation block on the proposal Cover Sheet. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost Sharing:

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

Other Budgetary Limitations:

Additional limitations to consider include the following:

- If materials are developed as part of a project, modest additions can be made to the budget limitations above, provided the materials will be field-tested and distributed broadly.

- NSF support for stipends for teachers is permitted up to $75 per day.
- Equipment purchase is not supported by NSF.
- Modest support will be provided for purchase of teacher materials in Comprehensive Projects for Student and Teacher projects.

C. Due Dates

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

Preliminary Proposals *required):*

October 17, 2003
Required for Youth-Based Projects
Required for Comprehensive Projects for Students and Teachers

Resource Centers will not be funded in Fiscal Year 2004
(See **REVISIONS AND UPDATES**)

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

January 31, 2004
Youth Based Projects

D. FastLane Requirements

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

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

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

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

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

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

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

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

The two National Science Board approved merit review criteria are listed below (see the Grant Proposal Guide Chapter III.A for further information). The criteria include considerations that help define them. These considerations are suggestions and

not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which he/she is qualified to make judgments.

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

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

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

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

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

Additional Review Criteria:

In addition to the Foundation-wide criteria described in Chapter III of the GPG, specific criteria used in evaluating **ITEST Youth-Based Project proposals** include:

- **Content Focus.** Does the content reflect a focus on IT or an IT-intensive STEM subject area? Do the content and instruction reflect the appropriate age and grade level(s) of targeted participants and allow for in-depth exploration of subject areas? Are the specific elements of the content plan presented or developed fully and include a description of how content will be aligned with national standards?

- **Project Design.** Are the participants engaged in meaningful year-round experiences? Will investigations lead to knowledge and understanding of IT or IT-intensive STEM subject areas? Do activities relate to the development of workplace skills and include guidance on college preparation? Is the expected duration of student involvement in the program clearly stated, and appropriate to achieve the stated learning outcomes? Is there an opportunity to work with scientists and/or IT professionals?

- **Impact.** Will the project have significant local or regional impact on the availability of IT experiences for youth? What is the potential for strengthening the IT literacy?

- **Recruitment.** Does the proposal include a plan for identifying potential participants and for encouraging their ongoing participation? Are there mechanisms to facilitate access by students from disadvantaged urban and rural communities? If there are other targeted characteristics (e.g., age range, academic ability, economic status, ethnicity/gender), does the plan identify how those individuals are recruited and selected?

- **Institutional Capacity:** What involvement has the proposing institution and/or its partners had in creating high-quality youth programs? What is the expertise of key staff proposed for this project?

- **Partnerships**. Proposals will be assessed based on the reasonableness of working relationships among partners and clear evidence of collaboration demonstrated in preparing the proposal. What is the likelihood that the project will facilitate greater interactions among professionals in museums, science/technology centers, community organizations, universities, cooperating school systems, and business/industry? Is there evidence that long-term relationships are likely to be forged that can supplement and support IT enrichment programs in a variety of settings?

- **Sustainability.** Does the proposal include plans for continuance of the program beyond NSF funding? What, if any, sustainability strategies will be employed?

- **Parental Involvement.** Are parents or primary caregivers included as partners in order to provide at-home continuity and support for students' learning experiences? Have feasible mechanisms for family involvement, that are sensitive to complexities/limitations of family schedules, been proposed? Is the parental interaction a meaningful part of the program implementation?

- **Research and Evaluation.** Does evaluation of overall project effectiveness include measures of students' learning outcomes and increased interest in pursuit of careers and further study in IT or IT-intensive STEM subject areas? If activity materials are developed, is there adequate testing of draft and prototype materials during the developmental stages?

Specific additional criteria used in evaluating proposals for **Comprehensive Programs for Students and Teachers** include:

- **Content Focus.** Does the content focus on IT and have the potential to improve STEM instruction? Are the content and instruction appropriate for the target grade levels? Does it include sufficient IT fundamentals as well as clear links to STEM instruction?

- **Project Design.** Are participating teachers involved in year-round activities? Will they continue to learn, reflect, and share their learning and experiences with project staff, colleagues and other participants? Will investigations lead to knowledge and understanding of IT and its contribution to specific STEM subject areas? Do activities help prepare teachers to use IT-related approaches in their STEM teaching? Is the duration in the program clearly stated and appropriate to achieve the project goals? Is there an opportunity to work with scientists and/or IT professionals?

- **Institutional Capacity:** What involvement has the proposing institution and/or its partners had in the development of teacher professional development programs? What is the expertise of key staff proposed for this project? Does the key staff have demonstrated experience in IT and IT application in STEM courses?

- **Impact.** Will the project have significant local or regional impact on classrooms? Will it provide a useful model for others? Are there provisions for dissemination?

- **Recruitment.** Does the proposal include a plan for identifying potential participants and for sustaining their ongoing participation? Are there mechanisms to encourage participation by teachers and students in schools from disadvantaged urban and rural communities? Is the recruitment strategy (population, region,

diversity, etc.) consistent with the project goals (content, strategy, support, etc.)?

- **Partnerships**. Does the project include the necessary partners to be successful? Are their roles and contributions clear and appropriate? Will the partners be accessible and have an ongoing role during the school year? Is there evidence that long-term relationships are likely to continue and support IT programs within the project and beyond?

- **Sustainability.** Does the proposal include plans for continuance of the program beyond NSF funding? What sustainability strategies will be employed to continue the project at the grantee institution, in the schools? Are there provisions for disseminating the project models and materials?

- **Research and Evaluation.** Does the project include evaluation of the overall project effectiveness? Is the formative evaluation plan reasonable to support the project development? Is the summative evaluation designed to measure the success in reaching the project goals? If applicable, is the research that emanates from the project likely to be useful and informative? If activity materials are developed, is there adequate testing of draft and prototype materials during the developmental stages?

Specific additional criteria used in evaluating proposals for **Resource Centers** include:

- **Lead Institution.** Does the lead institution demonstrate the capacity to plan, develop, and manage a national Center to support a diverse array of ITEST projects? Is the lead institution knowledgeable about IT and its applications in STEM, as well as of the formal and informal science education communities? Does the key staff have demonstrated expertise with research and IT, and its application in STEM in both formal and informal environments?

- **Project Design.** Does the project design provide a creative and comprehensive plan for ongoing technical support for ITEST projects? Are goals for various components, including organizing meetings, providing technical support, identifying resources, and disseminating information, clearly stated and pertinent to the overall program goals? Does the Resource Center model the exemplary use of IT throughout the project?

- **Research and Evaluation:** Does the narrative provide a clear and coherent plan for research on ITEST projects? Does the research add in a coherent way to the body of knowledge about IT and STEM learning, teaching and best practices in formal and informal settings? Does the project include an evaluation of the overall effectiveness of the Resource Center, as well as a plan for formative and summative evaluation?

- **Dissemination.** What strategies are planned to disseminate program outcomes, products and achievements to the field? Does the dissemination plan address the needs of formal and informal science education communities?

B. Review Protocol and Associated Customer Service Standard

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

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

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

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

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

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

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

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

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the

cognizant Program Officer at least 90 days before the end of the current budget period.

Additional reporting requirements may be included, e.g., to support program evaluation, as required.

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

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

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding this program should be made to:

- Umesh Thakkar, Lead Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5094, email: uthakkar@nsf.gov
- Michael R. Haney, Program Director, Directorate for Education & Human Resources, Division of Elementary, Secondary, & Informal Education, 885 S, telephone: (703) 292-5102, fax: (703) 292-9044, email: mhaney@nsf.gov

For questions related to the use of FastLane, contact:

- email: ehr-esi-@nsf.gov

IX. OTHER PROGRAMS OF INTEREST

The NSF *Guide to Programs* is a compilation of funding for research and education in science, mathematics, and engineering. The NSF *Guide to Programs* is available electronically at http://www.nsf.gov/cgi-bin/getpub?gp. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF E-Bulletin, which is updated daily on the NSF Website at http://www.nsf.gov/home/ebulletin, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's Custom News Service (http://www.nsf.gov/home/cns/start.htm) to be notified of new funding opportunities that become available.

Teacher Enhancement Program - (Elementary, Secondary, and Informal Education Program Solicitation and Guidelines [NSF 01-60] http://www.nsf.gov/cgi-bin/getpub?nsf0160).

Instructional Materials Development - (Instructional Materials Development (IMD) Program Solicitation [NSF-02-067] http://www.nsf.gov/cgi-bin/getpub?nsf02067).

Informal Science Education - (Elementary, Secondary, and Informal Education Program Solicitation and Guidelines [NSF 01-60] http://www.nsf.gov/cgi-bin/getpub?nsf0160).

Presidential Awards for Excellence in Mathematics and Science Teaching (http://www.ehr.nsf.gov/pres_awards/).

Advanced Technological Education (ATE) - (Advanced Technological Education (ATE) Program Solicitation [NSF 02-035] http://www.nsf.gov/cgi-bin/getpub?nsf02035).

Centers for Learning & Teaching (CLT) - (Centers for Learning and Teaching (CLT) [NSF 02-038] http://www.nsf.gov/cgi-bin/getpub?nsf02038).

Programs in other EHR Divisions that may be of interest to proposers to ITEST include:

Course Curriculum and Laboratory Improvement (CCLI) - instructional materials, courses for undergraduates, and professional development for faculty. (http://www.ehr.nsf.gov/EHR/DUE/programs/ccli/)

Program for Gender Equity in Science, Mathematics and Technology (PGE) - developing interest, knowledge, and involvement of girls and young women in STEM. (http://www.nsf.gov/pubs/2001/nsf01130/nsf01130.htm).

Graduate Teaching Fellows in K-12 Education (GK-12) - opportunities for graduate and upper division undergraduate students in STEM disciplines to work with mentor teachers in the nation's K-12 schools. (http://www.ehr.nsf.gov/dge/program/gk12).

Interagency Education Research Initiative (IERI) - Supports the establishment of a strong research base for education and learning, particularly in investigating scaling-up of proven interventions and the role of instructional technologies. IERI is a joint research activity between the NSF, the National Institute of Child Health and Development of NIH, and the Department of Education. (http://www.nsf.gov/cgi-bin/getpub?nsf0192).

Math and Science Partnership (MSP) - addresses the goal of increasing and sustaining the number, quality, and diversity of preK-12 teachers of mathematics and science through development of a professional education continuum that spans pre-service through career long professional growth. More information about this grant program can be found at http://www.ehr.nsf.gov/

National Science, Mathematics, Engineering, and Technology Education Digital Library (NSDL) - online networks of learning environments and resources for STEM education at all levels. (http://www.ehr.nsf.gov/EHR/DUE/programs/nsdl/).

Research on Learning and Education (ROLE) - research in four areas: (1) Brain research as a foundation for research on human learning; (2) Fundamental research on behavioral, cognitive, affective, and social aspects of human learning; (3) Research on STEM learning in formal and informal educational settings; and (4) Research on STEM learning in complex educational systems. (http://www.ehr.nsf.gov/EHR/REC/).

Science, Technology, Engineering, and Mathematics Teacher Preparation (STEMTP) - development of exemplary science, technology, engineering, and mathematics teacher preparation models. (http://www.ehr.nsf.gov/EHR/DUE/programs/stemtp/).

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