

Research on Gender in Science and Engineering FY 2004 (GSE)

Program Solicitation

NSF 03-588

Replaces Document NSF 03-502



National Science Foundation

Directorate for Education and Human Resources

Division of Human Resource Development

Preliminary Proposal Due Date(s) (required):

December 05, 2003
Research Proposals

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

December 05, 2003
Dissemination Proposals

February 27, 2004
Research Proposals. Those Encouraged based on review of preliminary proposal.

April 23, 2004
Dissemination Proposals

Supplement Due Date(s):

April 30, 2004
Supplements to Integrate Research-Based Practices

REVISIONS AND UPDATES

The scope of funding changes significantly in FY 2004.

- The development of new, innovative educational programs and experiments for students, teachers, and faculty will not be funded under this solicitation. A number of other NSF education programs now potentially fund proposals with a concentration

on gender, minority, and disability issues. (See Section IX for specific information.) Support for model or experimental projects is not a priority this fiscal year.

- A new offering of SUPPLEMENTS to existing grants is intended to promote the implementation of proven models and practices by gender experts in the context of systemic education initiatives and education centers. Critical selection factors in funding will be a) the research basis of the proven model or practice and b) the qualifications of the team introducing the model or practice. The array of proven good practices is rich, yet implementation is lagging. Thus the focus shifts toward integration, "embedding," and mainstreaming practices. There are now many credible experts in gender studies and science, technology, engineering, and mathematics (STEM) education who may be called on to act as consultants and integrators.
- Funding continues for research and dissemination of research and evaluation results. To be successful, a proposal must be situated within the current knowledge base on gender studies and STEM education, and ground itself in one or more disciplines.
- Emphasis on dissemination is strengthened by offering two deadlines under this solicitation in order to increase opportunity for timely funding. We assume that a lack of information is still impeding more widespread implementation of proven good practices and dissemination will encourage implementation.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Research on Gender in Science and Engineering FY 2004 (GSE)

Synopsis of Program:

The program seeks to broaden the participation of girls and women in all fields of science, technology, engineering, and mathematics (STEM) education by supporting research, dissemination of research, and integration of proven good practices in education that will lead to a larger and more diverse domestic science and engineering workforce. Typical projects will contribute to the knowledge base addressing gender-related differences in learning and in the educational experiences that affect student interest, performance, and choice of careers; and how pedagogical approaches and teaching styles, curriculum, student services, and institutional culture contribute to causing or closing gender gaps that persist in certain fields. Projects will disseminate and apply findings, evaluation results, and proven good practices. The Research on Gender in Science and Engineering program has been funding these objectives since 1993, under the prior names "Program for Women and Girls" (PWG), "Program for Gender Equity in Science, Mathematics, Engineering and Technology" (PGE), and "Gender Diversity in STEM Education" (GDSE).

Cognizant Program Officer(s):

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

- 47.076 --- Education and Human Resources

Eligibility Information

- **Organization Limit:**

Only current NSF grantees may submit requests for **Supplements** to Integrate Research-Based Practices. Current grantees may request only one supplement per grant. The duration of the supplement must be within the duration of the current grant.

There is no organization limit for proposals for Research or for Dissemination.

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

Award Information

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 20 to 25 - grants per year; a mix of Research Awards, Dissemination Awards, and Supplements to Integrate Research-Based Practices. The duration of these full grants will be from 1 to 3 years. Duration of supplements must be within the duration of the current award.
- **Anticipated Funding Amount:** \$5,000,000 for new grants, 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) :**
 - December 05, 2003
Research Proposals
- **Full Proposal Deadline Date(s)** (due by 5 p.m. proposer's local time):
 - December 05, 2003
Dissemination Proposals
 - February 27, 2004
Research Proposals. Those Encouraged based on review of preliminary proposal.
 - April 23, 2004
Dissemination Proposals
- **Supplement Proposals:**
 - April 30, 2004
Supplements to Integrate Research-Based Practices

Proposal Review Information

- **Merit Review Criteria:** National Science Board approved criteria apply.

Award Administration Information

- **Award Conditions:** Standard NSF award conditions apply.
- **Reporting Requirements:** Standard NSF reporting requirements apply.

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I. INTRODUCTION

One of the National Science Foundation's (NSF) key strategic goals is to invest in People: to develop a diverse, internationally competitive and globally-engaged workforce of scientists, engineers and well-prepared citizens (see <http://www.nsf.gov/od/gpra/start.htm>). Investments are directed at programs that strengthen scientific and engineering (S&E) research potential and education programs at all levels. These outcomes are essential to the Nation as we progress toward an increasingly technological job market and a scientifically complex society.

The Division of Human Resource Development (HRD) manages a portfolio of programs that aim to broaden the participation of traditionally underrepresented groups in science, technology, engineering and mathematics (STEM) learning and in the STEM workforce. Programs are in place to address the learning, interest and participation of women, underrepresented minorities (African-American, Hispanic, Native American), and persons with disabilities, at all levels.

The program for Research on Gender in Science and Engineering seeks to build resources - developing the Nation's knowledge capital, social capital, and human capital -- toward the goal of broadening the participation of girls and young women in STEM education from kindergarten through undergraduate education.

- **Research projects:** factors behind the underrepresentation of girls and women in STEM education; societal, formal and informal educational systems' interaction with individuals that encourage or discourage interest and persistence in study or careers in certain fields.
- **Dissemination:** make known education program evaluation results and research findings to significant national audiences, especially to the broader education community.
- **Supplements to integrate research-based practices** into systemic educational improvement: adopt and embed proven good gender-inclusive policies and practices in pedagogy, the design of curriculum materials, student support programs, educator and faculty development.

II. PROGRAM DESCRIPTION

A. ISSUES

Issues of concern underlying the need for the Program include:

- Our society – as experienced in education through parents, the media, educators, counselors, and faculty -- tends to reinforce traditional assumptions about the capabilities, interests, and career options for girls and women, steering them away from STEM courses and majors.
- At the same time, the demand for science and technology literacy on the part of all citizens has never been higher, and the demand for domestic workforce capacity in engineering and computer fields is far exceeding supply.
- The history of S&E design shows that optimal performance of S&E in the service of society requires that inquiry, discovery, and design be informed by diverse points of view and diverse research questions. If significant populations are not represented, the results are often inadequate.
- Gender biases are still evident in gender gaps at many stages of the STEM educational continuum: enrollment in elective and advanced high school courses to prepare for college; expression of interest in majors at the undergraduate level; retention of students in certain fields during undergraduate study; graduation rates; and entry into the science and engineering workforce.
- Socially projected stereotypes about who should be scientists and engineers pose artificial limits on the participation of talented students. Gender is only one of the characteristics that shape personal and group identity. Other characteristics such as race, ethnicity, economic status, religion, and disability also bear on whether students are encouraged, neglected, or discouraged from developing certain skills and ambitions. Our educational systems must seek to develop talent and interest in science, mathematics, and technology in all children.

Statistical profiles of STEM participation, with analyses, are documented in **Trends in Educational Equity of Girls and Women** (National Center for Education Statistics, U. S. Department of Education, NCES 2000-030) and the biannual publication **Women, Minorities, and Persons with Disabilities in Science and Engineering** (National Science Foundation, NSF 00-327) among others. (See <http://www.nsf.gov/sbe/srs/nsf00327/start.htm>.)

B. GOALS

The goal of Research on Gender in Science and Engineering (GSE) is to advance participation of women and girls in STEM fields

where they continue to be underrepresented, in accord with NSF's goal of developing a diverse science and engineering workforce. In the context of that overarching goal, the GSE program supports activities that address the following types of objectives.

Research

- To discover and describe gender-based differences and preferences in learning science and mathematics in K-16 and factors that affect interest, performance, and choice of STEM study and careers in fields where there are significant gender gaps;
- To discover and describe how experiences and interactions in informal and formal educational settings inhibit or encourage interest and performance of students based on gender;
- To increase the knowledge about organizational models that lead to more equitable and inviting STEM educational environments in K-16;
- To increase the knowledge of the process of institutional change required to achieve more equitable and inviting STEM educational environments in K-16.

Dissemination

- To extend to significant audiences awareness and information about research-based and demonstrated strategies and practices to increase the participation of girls and women in STEM education and workforce, in order to inform educational practice;
- To catalyze new thinking and future action among educational institutions by convening conferences, workshops, or symposia that are not possible at regular meetings of professional societies.

Integration

- To adopt and integrate research-based learning tools, pedagogical approaches and service or support programs that enhance the interest and persistence of female students in STEM studies through the undergraduate level, in those fields where they are underrepresented;
- To adopt and integrate instructional methodologies and teaching behaviors which research indicates may be particularly gender-equitable or female-friendly in the preparation of informal science education providers, pre-service and in-service K-12 teachers, as well as undergraduate faculty;
- To adopt and integrate methods and models for gender-equitable and non-traditional education and career counseling among adults, i.e., instructors, counselors, parents, etc., who influence students in formal and informal educational settings.

The goals of the GSE program, which originated in 1993 under the name "Program for Women and Girls" (PWG), parallel those of many other education and diversity programs at NSF except that they emphasize gender aspects.

C. DESCRIPTION - RESEARCH

Proposals in the Research area may seek to enhance the multidisciplinary understanding of STEM learning to the extent that differences are evident based on gender. Behavioral, cognitive, affective, and social differences may be investigated using methods of sociology, psychology, anthropology, economics, and statistics disciplines.

Successful proposals will incorporate relevant advances in research methodologies and theoretical models. They should capitalize on the development of new instrumental, computational or statistical methods, models, and tools of observation and analysis.

Proposals for research projects should include testable hypotheses and carry the expectation that the results obtained will be of

sufficient significance to merit peer review and publication. They should present the disciplinary and conceptual framework for the study. If a population sample is used, the proposal should describe the sample, rationale for sample selection, and the project's access to the sample population. The proposal should address whether the design is premised on special needs and interests due to educational level, race, ethnicity, economic status, or disability, in addition to gender, and to what extent data will be disaggregated for multiple characteristics.

The effort should provide a research foundation for educational approaches, curriculum, and technological tools that are already developed or can be developed in the future, bridging research and educational practice in settings such as classrooms, informal learning sites, and technological learning environments. The research foundation is assumed to provide a strong base of support for sustained improvement in STEM educational practice. Strong research designs will produce rigorous, cumulative, reproducible, and usable findings.

Investigators might:

- Investigate whether students have gender-based learning differences that are not accommodated by traditional approaches to teaching science and mathematics. For example, different conceptual strengths and weaknesses in learning certain math skills, different timing needs, different retention patterns, different preferences among computer interface features, interests in social interaction while learning, and interests in the social relevance and application of science experiments.
- Explore whether social and psychological behavior patterns of boys or girls in our society affect learning.
- Explore the socialization of males and females in our society that precludes or inhibits access, encouragement, support, and acceptance for interest in math and science topics. For example, assumptions or "gender schema" about appropriate careers, assumptions about the use of tools and technology, assumptions about the difficulties of embarking on or succeeding in a science or technology career.

Research proposals should include a dissemination plan to communicate findings to a national audience, particularly to education practitioners. Since the goal of the program is to contribute to a national knowledge base, it is important to show that the investigator is aware of appropriate channels -- specific peer-reviewed journals, publications, web sites, professional association conferences -- and is committed (including allocating resources) to make sure that the investment in the project leads to this contribution and that peers in the community will benefit.

D. DESCRIPTION - DISSEMINATION

Dissemination projects provide a mechanism for informing a wider audience about issues, research findings, and strategies for changing educational practice. Proposals for dissemination must justify a significant investment to reach a regional audience or national attention.

Investigators might:

- Organize a multidisciplinary meeting to consolidate knowledge about educational practice related to male or female students in K-16 STEM at a certain educational level. For example, a workshop on recruitment and retention in undergraduate engineering departments, a symposium on strategies for strengthening recruitment of students into computer science.
- Develop a media presentation (e.g., radio, TV, video, web) that educates the public about girls' or boys' education in STEM and factors contributing to interest, performance, or choice of careers.
- Significantly enhance distribution of an educational product (e.g., book, curriculum guide, seminar manual, web site) using economically and technologically strategic methods given the target audience.
- Target subgroups of educational practitioners, e.g. heads of science departments, deans, heads of research groups, teachers or faculty in a particular field.

Outcomes. Dissemination proposals should address how they will assess whether the method and content were successful, and

budget for some assessment. Examples of measures are:

- A significant audience is reached and their knowledge and attitudes are changed
- The audience acquires new knowledge
- The audience plans to adopt new institutional policies and practices related to gender and diversity
- New information products are developed by the project team or participants to further advance dissemination (e.g., synthesis, topical summary, review of research)

E. DESCRIPTION - SUPPLEMENTS TO INTEGRATE RESEARCH-BASED PRACTICES

Proposals for Integration projects will introduce, into already-initiated systemic education improvement projects or centers, proven new learning tools, pedagogical approaches, professional development models, or student programs and services that produce the outcome of proportional participation of both genders. Integration projects should propose ways to demonstrate that outcomes are achieved after the integration. (Applicants should review the section Outcome Measures below.)

Investigators might:

- Adopt and integrate informal and formal educational experiences that intervene and reverse traditional patterns of low participation; encourage girls' interest, enthusiastic participation, and election of continued study in math and science; increase confidence; and give girls positive images of math and science learning and careers.
- Adopt and integrate seminars, workshops, online courses, tutorials or other curriculum and approaches to teaching adults in the K-16 educational setting about the issues and interventions that are available. For example, adding modules to pre-service teacher education, developing standards for gender and multicultural teaching competency, conducting workshops combined with applied learning in student service programs for in-service teachers, holding seminars for pre-service and in-service undergraduate faculty, or mentoring between adults in order to assimilate new concepts and apply them in teaching practice.
- Work to integrate awareness of gender bias in educational environments, and change organizational commitment, policy, and action to remedy underrepresentation through student and faculty programs, for example, undergraduate departments in engineering, physical science, or computer science making a concentrated effort to increase recruitment and retention.
- Adopt and integrate new courses and curriculum that are gender-neutral or appeal particularly to girls and women. For example, ways of teaching math that utilize girls' verbal skills, sequencing material in computer science to introduce real-world applications of technology before intricacies of programming languages, teaching young girls principles of engineering design and invention in everyday life.

Proposals should identify the "model approaches" to be adopted, its theoretical basis and the research or evaluation basis for the "model," and address the benefits and issues bearing on integration in their educational setting.

Target participants may be a mix of students, teachers, counselors, parents, community leaders, administrators, faculty, student and adult mentors, and others. The participant population should be described, especially if the project design is premised on special needs and interests based on educational level, race, ethnicity, economic status, and disability, in addition to gender.

Commitment and Collaboration Between Partners. Funding will be provided through supplements to existing awards. Proposals are expected to be collaborations between large, complex NSF-funded projects engaged in educational reform and experts familiar with gender issues in STEM education. The grantee of the existing award is accountable for the outcomes of the supplement, to be achieved through a credible integration team.

Dissemination. Projects should include a plan to communicate about the integration project to a national audience, as appropriate within the scope of the larger effort.

Outcome Measures. Integration projects are not required to prove approaches and models -- it is assumed that they are integrating

proven practices. However, they should be prepared to confirm that outcomes are achieved, as part of good program management practice.

The following outcome measures are *illustrative*. See <http://oerl.sri.com> for evaluation resources collected for the benefit of NSF grantees. The short duration of Supplements will preclude certain measures.

K-12 Student Outcomes

- Change in test scores in math and science
- Change in grades
- Student confidence
- Student interest in STEM study
- Post-high school plans
- Post-high school status
- Student perceptions about the role of females in STEM
- Parents' report of student confidence
- Parents' report of student interest

K-12 Adult Outcomes

- Improved teaching
- Teacher perceptions about the role of females in STEM
- Parents' support for STEM learning

Post-Secondary Student Outcomes

- Change in college grades
- Student confidence
- Degree attainment
- Postgraduate plans
- Postgraduate status
- Student perceptions about the role of females in STEM

Post-Secondary Faculty Outcomes

- Improved teaching
- Faculty perceptions about the role of females in STEM

F. REFERENCES

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

Campbell, Patricia B., Eric Jolly, Lesli Hoey, Lesley K. Perman (2002). *Upping the Numbers: Using Research-Based Decision Making to Increase Diversity in the Quantitative Disciplines*. Commissioned by the GE Fund, January, 2002. Available at www.edc.org/spotlight/equity/upping.htm

Clewell, Beatriz Chu, Bernice Taylor Anderson, Margaret E. Thorpe (1992). *Breaking the Barriers: Helping Female and Minority Students Succeed in Mathematics and Science*. Jossey-Bass Publishers.

Clewell, B.C., & Campbell, P.B. (2002). Taking stock: Where we've been, where we are, where we're going. *Journal of Women and Minorities in Science and Engineering*, 8(3-4), 255-284. See www.campbell-kibler.com

Committee on Equal Opportunities in Science and Engineering (2002). *Biennial Report to the United States Congress*. Available at <http://www.nsf.gov/od/ceose>

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*.

Darke, Katherine, Beatriz Clewell, and Ruta Sevo (2002). Meeting the Challenge: The Impact of the National Science Foundation's Program for Women and Girls. *Journal of Women and Minorities in Science and Engineering*, 8(3&4), 285-303.

Davis, Cinda-Sue, Angela Ginorio, Carol Hollenshead, Barbara Lazarus, Paula Rayman, et al (1996). *The Equity Equation: Fostering the Advancement of Women in the Sciences, Mathematics, and Engineering*. Jossey-Bass Publishers.

Dietz, James S., Bernice Anderson, and Conrad Katzenmeyer (2002). Women and the Crossroads of Science: Thoughts on Policy, Research, and Evaluation. *Journal of Women and Minorities in Science and Engineering*, 8(3&4), 395-408.

Ginorio, Angela and Michelle Huston (2001). *Si, Se Puede! Yes, We Can: Latinas in School*. AAUW Education Foundation.

Margolis, Jane and Allan Fisher (2002). *Unlocking the Clubhouse: Women in Computing*. Cambridge, MA: MIT Press.

National Center for Educational Statistics (2000). *Entry and Persistence of Women and Minorities in College Science and Engineering Education*. NCES 2000-601

National Center for Educational Statistics (2000). *Trends in Educational Equity of Girls and Women*. NCES 2000-030

National Council for Research on Women (2001). *Balancing the Equation: Where Are Women and Girls in Science, Engineering and Technology?* Written by Mary Thom.

National Science Foundation (2003). *New Formulas for America's Workforce: girls in science and engineering*. Arlington, VA, 2003 (NSF 03-207 printed book, NSF 03-208 brochure+CD)

G. INFORMATION ABOUT PREVIOUS AWARDS

HRD's web site provides links to abstracts for and other information about awards made by this program under prior names (<http://www.ehr.nsf.gov/ehr/hrd/>). Historically, the program has been called "Program for Women and Girls" (PWG), "Program for Gender Equity in Science, Mathematics, Engineering, and Technology" (PGE), and "Gender Diversity in STEM Education" (GDSE).

NSF's web site provides the ability to search awards using custom queries (<https://www.fastlane.nsf.gov/a6/A6AwardSearch.htm>). To retrieve only GSE-related awards, use the query:

- 1544

To find more specific awards, it is possible to narrow the search:

- 1544 and mentoring
- 1544 and "learning community"
- 1544 and AZ
- 1544 and "middle school"

A compendium of profiles of projects funded in the first decade of the program, with a comprehensive index, is available as a printed

book, CD-ROM, and, as an online PDF file. It may be accessed at <http://www.ehr.nsf.gov/ehr/hrd/pge.asp> , or, <http://www.nsf.gov/pubsys/ods/> using one of the publication numbers:

National Science Foundation (2003). *New Formulas for America's Workforce: Girls in Science and Engineering*. Arlington, VA, 2003 (NSF 03-207 printed book, NSF 03-208 brochure+CD)

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

Research proposals may request up to \$500,000 for up to three years, pending availability of funds. The proposal should include a budget for each year and a summary budget if there are multiple years. (Awards will be fully funded in the first year.)

Dissemination proposals may request up to \$200,000 for up to 24 months, pending availability of funds.

Supplements to Integrate Research-Based Practices may be up to \$200,000 for up to two years, pending availability of funds.

The proposed start dates should be at least seven months from the full proposal deadline.

Funds should be budgeted for the principal investigator to attend a two-day grantees' meeting in Washington, D.C. area, each award year (February/March time frame).

A limited equipment request (<10% of total budget) is allowed for projects intensive in educational technology, for development. Equipment for participants in student or educator demonstration programs, and office equipment for project staff are expected to come from other sources.

GSE research projects are eligible for REU (Research Experiences for Undergraduates) supplements, which expressly support the participation of undergraduate students on the project research team, if funds are available. Please see the REU announcement for complete parameters and the method for making a request for an REU supplement (see <http://www.nsf.gov/home/crssprgm/reu/start.htm>). Proposers should consult the Program Director in advance of a request for REU supplements.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals (*required*):

A preliminary proposal is only applicable for Research proposals. It is required prior to the submission of a full proposal. It will be reviewed by NSF staff and/or external reviewers to provide input for developing a full proposal. A full proposal will be Encouraged based on the review of the preliminary.

The preliminary or preproposal must be submitted via Fastlane.

Cover Sheet: Be sure to check the **PRELIMINARY PROPOSAL box**. Select the program name "Research on Gender in Science and Engineering" in the Education and Human Resources Directorate, Human Resource Development.

PROJECT SUMMARY: A short abstract (one page or less, single spaced) that clearly identifies the major features of the project. Address each NSF criterion separately: intellectual merit and broader impacts.

PROJECT DESCRIPTION: The narrative is limited to 5 pages in length. It should sketch, in broad terms, the essential features of the project:

1. What is the research goal? What is the research question?
2. What findings are expected?
3. What is the contribution to the knowledge base? Reference prior related work and explain the value added and the national benefit of the work.
4. What is the study population and the plan to reach the population?
5. Describe the conceptual or disciplinary framework and methods to be used.
6. Identify key team members, consultants, and advisors. Relate their qualifications and skills to specific components of the proposed work in one or two sentences.
7. Describe plans for broad dissemination.

BIOGRAPHICAL SKETCH of the PI and co-PI's is required. No budget pages are required; a requested total amount on the cover sheet is sufficient. Supplemental materials or appendices 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.

The following instructions supplement the GPG guidelines for full proposals.

FULL PROPOSALS

On the **COVER SHEET**, select the program name "Research on Gender in Science and Engineering" in the Education and Human Resources Directorate, Human Resource Development.

The **TITLE** should be prefaced with an abbreviation identifying the GSE goal supported by the proposal:

- RES - for research proposals
- DIS - for dissemination proposals

The **PROJECT SUMMARY** should:

- Name and describe the proposed activity (what and how: research, dissemination)
- Describe the research question (or hypothesis) or audience impact
- Describe the target research subjects or audience (who)
- State the organizations involved (who)
- Especially highlight the contribution to knowledge, social, or human capital (why)

- Address each NSF review criterion separately: intellectual merit and broader impacts

The **Research PROJECT DESCRIPTION** should address:

- What is the research goal? What is the research question?
- What findings are expected?
- What is the contribution to the knowledge base? Reference prior related work and explain the value added and the national benefit of the work.
- What is the study population and the plan to reach the population?
- What is the theoretical basis for the research question?
- Describe the conceptual or disciplinary framework and methods to be used.
- Identify key team members, consultants, and advisors. Relate their qualifications and skills to specific components of the proposed work.
- For prior grantees, a discussion of the results of prior work.

Common weaknesses in research proposals (according to Dietz, et al, 2002) are:

1. Poor formulation of research questions
2. Poor articulation of program design and theory
3. Failure to recognize multiple studies have been conceived as a single study
4. Failure to situate the study or its potential findings within prior work and literature
5. Failure to situate the study or its potential findings within a framework or theory
6. Weak links between research goals and proposed methodology

The **Dissemination PROJECT DESCRIPTION** should address:

- What will be disseminated?
- What is the goal of the dissemination, and what is the justification for the dissemination (meeting or media product)?
- What audience will it reach and what is the desired impact on the audience?
- What is the context of the dissemination; what other projects, events, or products exist and how does this project contribute national benefits?
- Describe the management plan and timeline.
- Describe the qualifications of key team members and suitability for their role in the project.
- A list of advisory committee members and description of their level of involvement, if an advisory committee is proposed.
- For prior grantees, a discussion of the results of prior work.

SUPPLEMENT REQUESTS

The **TITLE** for a **Supplement to Integrate Research-Based Practices** request should begin with "**GSE**."

The justification (5-10 pages) for a **Supplement** should describe:

- What is the research-based model or practice that will be implemented?
- What resources are available to interpret and adapt the model or practice (guides, manuals, curricula, experts)?
- How does the integration project fit in with the scope of the host grant?
- Who are the target participants and how will they be reached?
- Who is on the integration team and what are their credentials and experience with the model or practice – or similar projects, gender studies, STEM education, and the target participants?
- What impact or outcomes are expected and will outcomes be measured?
- A list of advisory committee members and description of their level of involvement, if an advisory committee is proposed.
- For complex integrations, a management plan and descriptions of the roles of collaborating partners.
- Describe how the Integration project will be disseminated to professional peers and to the education community, and how this fits in with the dissemination plans of the host grant.)

Organizations submitting a request for a Supplement should contact both the NSF program director for the current grant and the GSE program director, to make them aware of the intention to submit. Once submitted, the supplement request must be proactively shared with GSE for review and processing.

Requests for supplements may be reviewed internally by NSF using the standard review criteria. The process may take less than the NSF target of six months, but submitters should allow for six months from the Supplement submission deadline.

A request for a supplement to an existing NSF award is submitted via the Fastlane Notifications and Request module using the "Supplemental Funding Request" option. The Investigator enters the description and justification for the activity. The budget may include indirect costs. The request is then forwarded to the institution's Sponsored Research Office for submission to NSF.

Proposers are reminded to identify the program announcement/solicitation number (03-588) 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:

Research budgets may be up to \$500,000.

Dissemination budgets may be up to \$200,000.

Supplements for Integration of Research-based Practices may be up to \$200,000.

Funds should be budgeted for the principal investigator or a project member to attend a two-day grantee's meeting in Washington, D.C. area, each award year, in February/March. A limited equipment request (<10% of total budget) may be allowed. (See Section IV.)

C. Due Dates

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

Preliminary Proposals (*required*):

December 05, 2003
Research Proposals

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

December 05, 2003
Dissemination Proposals

February 27, 2004
Research Proposals. Those Encouraged based on review of preliminary proposal.

April 23, 2004

Supplement Date(s):

April 30, 2004
Supplements to Integrate Research-Based Practices

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.

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.

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:

- Toni Edquist, Program Assistant, Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4649, email: tedquist@nsf.gov
- Ruta P. Sevo, Program Director, Directorate for Education & Human Resources, Division of Human Resource Development, 815 N, telephone: (703) 292-4676, fax: (703) 292-9018, email: rsevo@nsf.gov

For questions related to the use of FastLane, contact:

- Gloria Strothers, Lead Program Assistant, Directorate for Education & Human Resources, Division of Human Resource Development, 815 N, telephone: (703) 292-4718, fax: (703) 292-9018, email: gstrothe@nsf.gov
- Victoria A. Smoot, Program Specialist, Directorate for Education & Human Resources, Division of Human Resource Development, 815 N, telephone: (703) 292-4677, fax: (703) 292-9018, email: vsmoot@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.

Research on Gender in Science and Engineering is among NSF education programs, and among programs that promote the participation of under-represented groups. For a complete list of programs in Education and Human Resources see <http://www.ehr.nsf.gov/>. For a complete list of programs in the Division for Human Resource Development see <http://www.ehr.nsf.gov/ehr/hrd/>. Most of the programs listed below potentially support special emphasis on gender, minority, and disability issues. **Some are funding projects like those funded by this program in the past.**

Curriculum

- Course, Curriculum, and Laboratory Improvement (CCLI) ([NSF 03-558](#))
- Instructional Materials Development (IMD) ([NSF 03-524](#))
- CISE Educational Innovation Program ([NSF 02-082](#), [NSF 02-079](#))
- Engineering Education Program (PD 01-1340)

Teacher Preparation

- NSF Graduate Teaching Fellows in K-12 Education (GK-12) ([NSF 03-532](#))
- Teacher Professional Continuum (TPC) ([NSF 03-534](#))
- Centers for Learning and Teaching (CLT) ([NSF 03-522](#))
- Information Technology Experiences for Students and Teachers (ITEST) ([NSF 02-14](#))

Student Programs

- Math-Science Partnerships (MSP) (www.ehr.nsf.gov/msp) (NSF 03-541)
- Information Technology Experiences for Students and Teachers (ITEST) (NSF 02-147)
- Science, Technology, Engineering and Mathematics Talent Expansion Program (STEP) (NSF 03-548)

Informal Education

- Informal Science Education (ISE) (NSF 03-511)
- Information Technology Experiences for Students and Teachers (ITEST) (NSF 02-147)

Technology/IT

- Information Technology Experiences for Students and Teachers (ITEST) (NSF 02-147)
- Advanced Technological Education Program (ATE) (NSF 03-523)
- Computer Science, Engineering, and Mathematics Scholarships (CSEMS) (NSF 03-501)
- Information Technology Workforce (NSF 01-33 and NSF 02-170)
- National STEM Education Digital Library (NSDL) (NSF 03-530)
- CISE Educational Innovation Program (NSF 02-082, NSF 02-079)

Research

- Evaluative Research and Evaluation Capacity Building (EREC) and Research on Learning and Education (ROLE) (NSF 03-542)
- Interagency Education Research Initiative Program (IERI) (www.ehr.nsf.gov/rec)
- Centers for Learning and Teaching (CLT) (NSF 03-522)
- Societal Dimensions of Engineering, Science and Technology (SDEST) (NSF 01-152)
- Research Experiences for Undergraduates (REU) Supplements and Sites (NSF 01-121)
- Science of Learning Centers (SLC) (NSF 03-573)

Engineering

- Bridges for Engineering Education (BEE) (NSF 02-092)
- Engineering Education Program (PD 01-1340)

Mathematics

- Vertical Integration of Research and Education in Mathematical Sciences (VIGRE) (NSF 02-120)

Addressing Under-representation

- ADVANCE: Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers (NSF 02-121)
- Program for Persons with Disabilities (PPD) (NSF 02-177)

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees 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, although some programs may have special requirements that limit eligibility.

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 GPG Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

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 Website 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

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 proposal 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.

An agency may not conduct or sponsor, and a person is not required to respond to an information collection unless it displays a valid OMB control number. The OMB control number for this collection is 3145-0058. 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: Suzanne Plimpton, Reports Clearance Officer, Division of Administrative Services, National Science Foundation, Arlington, VA 22230.

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