

Science, Technology, Engineering and Mathematics (STEM) Education Organizational Postdoctoral Research Fellowships (STEM Ed OPRF)

PROGRAM SOLICITATION NSF 23-545



National Science Foundation

Directorate for STEM Education
Division of Graduate Education
Division of Equity for Excellence in STEM
Research on Learning in Formal and Informal Settings
Division of Undergraduate Education

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

April 28, 2023

Last Friday in April, Annually Thereafter

IMPORTANT INFORMATION AND REVISION NOTES

Revision Notes

This solicitation replaces solicitation [NSF 22-531](#) that supported individual fellowship awards, single institutional projects, and collaborative institutional projects. Beginning in fiscal year 2023, the STEM Ed PRF Program will conduct two competitions using separate solicitations. This solicitation applies to Organizational Fellowship proposals only and is limited to proposals from single organizations. Separately submitted collaborative proposals are not allowed. The more general term "organizational" is used in this solicitation rather than "institutional" to indicate that proposals are welcome from institutions of higher education and non-profit, non-academic organizations.

Proposals submitted in response to this program solicitation must be prepared and submitted via Research.gov or Grants.gov and may not be prepared or submitted via FastLane.

Any proposal submitted in response to this solicitation should be submitted in accordance with the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) that is in effect for the relevant due date to which the proposal is being submitted. The NSF PAPPG is regularly revised and it is the responsibility of the proposer to ensure that the proposal meets the requirements specified in this solicitation and the applicable version of the PAPPG. Submitting a proposal prior to a specified deadline does not negate this requirement.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Science, Technology, Engineering and Mathematics (STEM) Education Organizational Postdoctoral Research Fellowships (STEM Ed OPRF)

Synopsis of Program:

The Directorate for STEM Education (EDU) STEM Education Postdoctoral Research Fellowships (STEM Ed PRF) Program funds postdoctoral fellowship projects designed to enhance the research knowledge, skills, and practices of STEM Education research by recent doctoral graduates in STEM, STEM Education, Education, and related disciplines. This solicitation supports organizational postdoctoral fellowship projects; a companion solicitation (STEM Ed IPRF) supports individual postdoctoral fellowship awards. The Program is designed to broaden the pool of researchers who can advance knowledge regarding STEM learning and learning environments, broadening participation in STEM fields, and STEM workforce development. Principal Investigators who are women, veterans, persons with disabilities, and from groups underrepresented in STEM, or who have attended community colleges and minority-serving institutions (e.g. Historically Black Colleges and Universities, Tribal Colleges and Universities, Hispanic Serving Institutions, Alaska Native Serving Institutions, and Hawaiian Native and Pacific Islander Serving Institutions) are especially encouraged to apply.

STEM Ed OPRF awards provide support to organizations as they develop a STEM education postdoctoral research fellowship project and support a cohort of fellows. The program should enable fellows to engage in ongoing research, to develop independent research, and to implement an independent professional development plan under the guidance of a sponsoring researcher. Fellows are expected to devote themselves full time to the fellowship activities for the duration of the fellowship.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- STEM Education PRF, telephone: (703) 292-2321, email: STEMEdPRF@nsf.gov

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

- 47.076 --- STEM Education

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 2 to 4

Anticipated Funding Amount: \$2,500,000

Subject to availability of funds and the quality of proposals received.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Proposals may only be submitted by the following:
 - **Institutions of Higher Education (IHEs)** Two-and four-year IHEs (including community colleges) accredited in, and having a campus located in the U.S., acting on behalf of their faculty members.
 - **Non-profit, Non-Academic Organizations** Independent museums, observatories, research laboratories, professional societies and similar organizations located in the U.S. that are directly associated with educational or research activities.
- Fellows supported through organizational awards must meet the following eligibility requirements:
 - Be a U.S. citizen, national, or permanent resident;
 - Have earned the doctoral degree, or expect to have earned the doctoral degree in a field of science, technology, engineering, or mathematics (STEM), STEM Education, Education, or a related discipline prior to the earned no more than 24 months;
 - Must not hold a tenure-track position,

Who May Serve as PI:

PIs and co-PIs must hold full-time positions at the proposing organization in STEM, STEM education, Education, or a related discipline with a research emphasis in STEM education. This may include but is not limited to individuals with full-time academic or research appointments, those who hold positions at non-profit, non-academic organizations, such as museums, observatories, research laboratories, professional societies and similar organizations located in the United States.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or co-PI:

There are no restrictions or limits.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**
 - Full Proposals submitted via Research.gov: *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.
 - Full Proposals submitted via Grants.gov: *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov* guidelines apply (Note: The *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide).

B. Budgetary Information

- **Cost Sharing Requirements:**

Inclusion of voluntary committed cost sharing is prohibited.
- **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

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

April 28, 2023

Last Friday in April, Annually Thereafter

Proposal Review Information Criteria

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

The STEM Ed PRF Program contributes to a larger effort to build our Nation's capacity to conduct STEM education research by funding early-career scholars who can contribute to the STEM education enterprise. Projects should be designed to produce insights that inform the development or application of theories and/or examine phenomena of importance to the mission of NSF's Directorate for STEM Education (EDU) including STEM learning and learning environments, broadening participation in STEM, and STEM workforce development.

These programmatic and Directorate goals align and contribute to the National Science Foundation's goals of promoting discovery, learning, research infrastructure and stewardship. NSF supports projects judged as promising to "(1) advance the frontiers of knowledge; cultivate a world-class, broadly inclusive science and engineering workforce; and expand the scientific literacy of all citizens; (2) build the nation's research capability through investments in advanced instrumentation and facilities; and (3) support excellence in science and engineering research and education through a capable and responsive organization" (<https://www.nsf.gov/about/glance.jsp>). They align with the Foundation's 2022-2026 [Strategic Goals](#) to empower STEM talent to fully participate in science and engineering; create new knowledge about our universe, the world, and ourselves; and benefit society by translating knowledge into solutions.

Working towards the objectives of furthering the Nation's ability to develop an effective STEM workforce and scientifically literate citizenry requires responsive

STEM education informed by robust STEM education research. Examples of research projects that connect to these goals include but are not limited to research employing or developing theories to explain factors that impede or promote individuals' learning in various contexts; factors that influence the recruitment, persistence, and progression of underrepresented populations in STEM courses of study and careers; and the skills, experiences, and affective characteristics that prepare individuals for the current and emerging STEM professional workforce.

The STEM Ed PRF Program aims also to foster new and more effective interventions and innovations in STEM education, broadening participation, and workforce development. STEM education research generates the knowledge, theories, and understandings on which viable strategies for enhancing performance or addressing gaps in STEM learning, broadening participation in STEM, and STEM professional workforce development are based.

II. PROGRAM DESCRIPTION

The STEM Ed PRF Program supports professional development activities of a cohort of postdoctoral fellows in settings that will position them for careers as STEM education research scholars. The STEM Ed PRF Program encourages proposals that support postdoctoral experiences for those holding doctorates in STEM, STEM Education, Education, and related disciplines who have career interests in STEM education research.

Examples of Professional Development Activities

To successfully conceptualize, design, and execute studies capable of making contributions to knowledge in STEM teaching and learning, broadening participation, and workforce development, investigators and their teams typically require a wide range of knowledge, skills, expertise, and experiences. Examples of relevant professional development activities include but are not limited to:

- Connecting with new or broadening existing professional networks
- Gaining teaching experience or experience with grant writing
- Deepening knowledge of subject-matter literature
- Examining interdisciplinary perspectives
- Operationalizing new research questions and articulating relevant theories of change
- Developing additional expertise in study design, research methods, and data analysis techniques
- Augmenting expertise aligned with changing educational practices
- Synthesizing existing research findings
- Collecting, managing, documenting, and archiving data to facilitate replication and reproducibility studies and secondary analyses

Examples of Research Topics

The STEM Ed PRF Program invites proposals with a wide range of disciplinary perspectives and welcomes fundamental research proposals across the three research areas: STEM learning and learning environments, broadening participation in STEM, and STEM workforce development. The following list of research topic clusters is neither exhaustive nor mutually exclusive, and the program is open to other topic clusters that advance fundamental knowledge across the three research areas.

- Diversity, equity, and inclusion in STEM
- Factors at the neural, cognitive, institutional, structural, organizational, societal, and systemic levels that affect STEM education and/or the STEM workforce
- STEM teaching and learning in preK-12, undergraduate, graduate, workplace, and/or informal contexts
- Research on technology-enabled learning
- STEM education policy research and
- Research that builds on and expands the foundations for evaluating STEM education and/or STEM workforce development initiatives

Organizational Postdoctoral Fellowship Proposals

This solicitation supports organizational postdoctoral fellowship projects; a companion solicitation (STEM Ed IPRF) supports individual postdoctoral fellowship awards. The Organizational Postdoctoral Fellowship projects provide an opportunity for organizations to design a postdoctoral fellowship program that 1) facilitates the acquisition of STEM education research expertise, skills, and competencies to engage in fundamental STEM education research and 2) provides professional development professional development opportunities that will enable fellows to become independent STEM education research scholars. The STEM Ed PRF Program encourages proposals from minority-serving institutions and the inclusion of women, persons with disabilities, and members of groups underrepresented in the STEM workforce as fellows. Fellows must meet the eligibility requirements in **Section IV. Eligibility Information**.

III. AWARD INFORMATION

Pending availability of funds, NSF anticipates approximately \$2,500,000 will be available for the FY 2023 competition.

Duration: Up to 36 months of support may be requested.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Proposals may only be submitted by the following:
 - **Institutions of Higher Education (IHEs)** Two-and four-year IHEs (including community colleges) accredited in, and having a campus located in the U.S., acting on behalf of their faculty members.
 - **Non-profit, Non-Academic Organizations** Independent museums, observatories, research laboratories, professional societies and similar organizations located in the U.S. that are directly associated with educational or research activities.
- Fellows supported through organizational awards must meet the following eligibility requirements:
 - Be a U.S. citizen, national, or permanent resident;
 - Have earned the doctoral degree, or expect to have earned the doctoral degree in a field of science, technology, engineering, or mathematics (STEM), STEM Education, Education, or a related discipline prior to the earned no more than 24 months;
 - Must not hold a tenure-track position,

Who May Serve as PI:

PIs and co-PIs must hold full-time positions at the proposing organization in STEM, STEM education, Education, or a related discipline with a research emphasis in STEM education. This may include but is not limited to individuals with full-time academic or research appointments, those who hold positions at non-profit, non-academic organizations, such as museums, observatories, research laboratories, professional societies and similar organizations located in the United States.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or co-PI:

There are no restrictions or limits.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Research.gov or Grants.gov.

- Full Proposals submitted via Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov*. The complete text of the *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide. To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov.

See PAPPG Chapter II.D.2 for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the PAPPG instructions.

The following information and instructions supplement the guidelines provided in the PAPPG and NSF Grants.gov Application Guide.

- **Project Summary:** Not to exceed one page, that includes three separate sections: Overview, Intellectual Merit, and Broader Impacts. The Overview section should contain an overview of the research and training plan, as well as an overview of the recruitment/application/selection strategy. The summary should clearly address with separate headings the intellectual merit and broader impacts of the proposed program.
- **Project Description:** Not to exceed fifteen single-spaced pages (including any figures, pictures, and tables). In accordance with the guidance in the PAPPG, the Project Description must include a separate section labeled "Broader Impacts". In addition, the project description should include the following six sections: significance, research training plan, professional development plan, evaluation plan, personnel, and recruitment/application/selection plans.
 - **Significance:** Describe the importance of the proposed postdoctoral fellowship project as well as its relation to the goals of the STEM Ed PRF Program. As relevant, describe the proposed project's strategies for broadening participation of members of underrepresented groups in STEM education research.
 - **Research Training Plan:** Describe the scope of activities that will actively engage fellows in ongoing and independent research projects that promote their development beyond their doctoral dissertation work and help establish them as self-directed scholars. Activities should include networking and cohort-building activities.
 - **Professional Development Plan:** Describe the professional development opportunities that will assist fellows in developing professional competencies, for example, acquisition of new research methods, knowledge of the research literature, participation in scholarly communities, proficiency in instruction, or grant writing skills. The professional development opportunities should extend beyond the typical kinds of professional development activities expected of new scholars. Also note that teaching activity (no more than one course per year) should be incorporated into the professional development plan if such experience is deemed valuable for the fellow's future career development.

Activities should include networking and cohort-building activities.

- **Evaluation Plan:** Describe the plan that will be used to evaluate the success of the postdoctoral program, including the metrics and methods used in the evaluation design. Special attention should be paid to evaluating the effectiveness of the program in supporting the development of highly prepared STEM education researchers, including those who are women and members of groups underrepresented in STEM. The evaluator(s) may be internal or external to the organization but should not include personnel involved in the design or delivery of the fellowship project. Pls may wish to enlist specialists in education research, either from their own organization or others, to serve as evaluators.
- **Personnel:** Describe the expertise and experience of the project team and their specific roles and responsibilities in the proposed research and professional development activities. This section should address the ways in which mentors would guide the research and professional development of the postdoctoral fellow cohort.
- **Recruitment/Application/Selection Plan:** Describe strategies and criteria for the recruitment, application process, and selection of the cohort of postdoctoral fellows. The plan should include, as relevant, efforts to recruit postdoctoral fellows who are members of groups underrepresented in STEM and those from Minority Serving Institutions (MSIs).
- **Budget:** Organizational fellowships will be awarded up to \$1,250,000 for a duration of up to three years. Other limitations apply. Please see section V.B. *Budgetary Information* in this document for further guidelines.
- **Budget Justification:** A budget justification that lists and justifies estimated expenditures for the fellowship program and its administration.
- **Supplementary Documentation:** Must include the following:
 - **Data Management Plan:** Not to exceed two pages, must describe plans for data management and sharing of the products of research, or asserts the absence of the need for such plans. See EDU guidelines at <https://www.nsf.gov/bfa/dias/policy/dmpdocs/ehr.pdf>. This supplementary document should describe how the proposal will conform to NSF policy on the dissemination and sharing of research results. Proposers should refer to the NSF PAPPG for additional guidance.

A valid Data Management Plan may include only the statement that no detailed plan is needed as long as the statement provides a clear justification. The Data Management Plan will be reviewed as an integral part of the proposal, considered under Intellectual Merit or both, as appropriate for the scientific community of relevance.

- **Postdoctoral Mentoring Plan:** Not to exceed one page, describing the culture and context for the postdoctoral fellowship program. The goal of the mentoring plan is to provide the skills, knowledge, and experience to prepare the postdoctoral researcher to excel in his/her/their career path. To accomplish this goal, the mentoring plan will enhance the postdoctoral experience by providing structured STEM education research capacity building skills, professional development opportunities, and career readiness skills. The postdoctoral mentoring plan should describe the PI's and Co-PI's experience in mentoring postdocs, including in mentoring underrepresented minorities (if applicable), the expected availability of the mentors for consultation during the award period, the environment in which the fellows will be trained and mentored, and resources that are available to support the proposed fellowship activities. For further information, proposers are advised to consult the NSF PAPPG.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Other budgetary limitations apply. Please see the full text of this solicitation for further information.

Budget Preparation Instructions:

The STEM Ed PRF Program is intended primarily to support postdoctoral fellowships. Thus, the project budget must reflect reasonable allocations for fellowship salaries and professional development expenses. Postdoctoral fellows must be paid \$70,000 annually per fellow for 24 months. Other postdoctoral fellow expenses might include travel costs related to research and professional development, research expenses such as equipment or participant stipends, and fringe benefit expenses such as health insurance. The approximate number of postdoctoral fellows expected in the two-year cohort is two to four, with a minimum of two postdoctoral fellows at any organization hosting STEM Ed PRF fellows.

Note: It is expected that the first year of the organizational awards will primarily involve project administration, such as advertising the fellowship opportunities, recruiting candidates, and selecting fellows, with postdoctoral fellows beginning the project at the start of the second year.

C. Due Dates

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

April 28, 2023

Last Friday in April, Annually Thereafter

D. Research.gov/Grants.gov Requirements

For Proposals Submitted Via Research.gov:

To prepare and submit a proposal via Research.gov, see detailed technical instructions available at: https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparationandSubmission.html. For Research.gov user support, call the Research.gov Help Desk at 1-800-673-6188 or e-mail rgov@nsf.gov. The Research.gov Help Desk answers general technical questions related to the use of the Research.gov system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: <https://www.grants.gov/web/grants/applicants.html>. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to Research.gov for further processing.

Proposers that submitted via Research.gov may use Research.gov to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in PAPPG Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: https://www.nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Leading the World in Discovery and Innovation, STEM Talent Development and the Delivery of Benefits from Research - NSF Strategic Plan for Fiscal Years (FY) 2022 - 2026*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which 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.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand

their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (PAPPG Chapter II.D.2.d(i). contains additional information for use by proposers in development of the Project Description section of the proposal). Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.D.2.d(i), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
 - a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 - b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and other underrepresented groups in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements or the Division of Acquisition and Cooperative Support for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform 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.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by an NSF Grants and Agreements Officer. Organizations whose proposals are declined will be

advised as promptly as possible by the cognizant NSF Program 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.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award notice, 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 notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at https://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

Administrative and National Policy Requirements

Build America, Buy America

As expressed in Executive Order 14005, *Ensuring the Future is Made in All of America by All of America's Workers* (86 FR 7475), it is the policy of the executive branch to use terms and conditions of Federal financial assistance awards to maximize, consistent with law, the use of goods, products, and materials produced in, and services offered in, the United States.

Consistent with the requirements of the Build America, Buy America Act (Pub. L. 117-58, Division G, Title IX, Subtitle A, November 15, 2021), no funding made available through this funding opportunity may be obligated for an award unless all iron, steel, manufactured products, and construction materials used in the project are produced in the United States. For additional information, visit NSF's [Build America, Buy America](#) webpage.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. 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 Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the NSF *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- STEM Education PRF, telephone: (703) 292-2321, email: STEMEdPRF@nsf.gov

For questions related to the use of NSF systems contact:

- NSF Help Desk: 1-800-673-6188
- Research.gov Help Desk e-mail: rgov@nsf.gov

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "NSF Update" is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF [Grants Conferences](#). Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. "NSF Update" also is available on [NSF's website](#).

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this mechanism. Further information on Grants.gov may be obtained at <https://www.grants.gov>.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities (FASSED) provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See the *NSF Proposal & Award Policies & Procedures Guide* Chapter II.F.7 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

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 <https://www.nsf.gov>

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
- **For General Information** (NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
 - Send an e-mail to: nsfpubs@nsf.gov
 - or telephone: (703) 292-8134
- **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; and 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 proposer 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 or other entities needing information regarding applicants or nominees as part of a joint application review process, or in

order to coordinate programs or policy; 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 [System of Record Notices](#), [NSF-50](#), "Principal Investigator/Proposal File and Associated Records," and [NSF-51](#), "Reviewer/Proposal File and Associated Records." 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 Office of Management and Budget (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 the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

Suzanne H. Plimpton
Reports Clearance Officer
Policy Office, Division of Institution and Award Support
Office of Budget, Finance, and Award Management
National Science Foundation
Alexandria, VA 22314

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