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Facilitator of Polar STEAM (Polar STEAM)

Polar Science, Technology, Engineering, Arts and Mathematics

PROGRAM SOLICITATION

NSF 21-618



National Science Foundation

Directorate for Geosciences
Office of Polar Programs

Directorate for Education and Human Resources
Division of Undergraduate Education
Division of Human Resource Development
Research on Learning in Formal and Informal Settings

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

February 25, 2022

IMPORTANT INFORMATION AND REVISION NOTES

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) ([NSF 22-1](#)), which is effective for proposals submitted, or due, on or after October 4, 2021.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Facilitator of Polar STEAM (Polar STEAM)
Polar Science, Technology, Engineering, Arts and Mathematics

Synopsis of Program:

NSF's Office of Polar Programs (OPP) and the Directorate for Education and Human Resources (EHR) seek proposals for a Facilitator to manage a Polar Science, Technology, Engineering, Arts, and Mathematics (Polar STEAM) initiative. The successful proposal for the Facilitator of Polar STEAM will be administered as a Cooperative Agreement (CA) over a five-year period of performance, with the option for a renewal for up to five years pending review.

Polar STEAM is a new initiative, which encompasses and enriches two longstanding efforts:

- an Antarctic Artists and Writers (AAW) program to support writing and artistic projects specifically designed to increase the public's understanding and appreciation of the Antarctic and the human endeavors on the southernmost continent; and
- support for educators, both formal and informal, to travel to the Antarctic and Arctic to work collaboratively with researchers (hereafter, the Polar Educators program).

These efforts have for decades provided a unique professional development opportunity that benefited not only the individual artists, writers, and educators but also the diverse communities they served. Both programs provided unique avenues for NSF-funded researchers to enhance the Broader Impact of their work. Incorporating Art into STEM learning experiences (commonly referred to as STEAM, e.g., Science, Technology, Engineering, Arts, Mathematics) allows students of all ages to access science concepts from different vantage points, promotes creative thinking, speaks to a broader swath of learners, and enhances engagement and understanding. Polar STEAM will promote diversity, equity and inclusion in polar science programs and allow for participation by a broader range of educators.

The Facilitator of Polar STEAM will be responsible for managing the AAW and Polar Educator program(s) as parallel but synergistic programs that promote connections and innovative partnerships between their participants. To accomplish this, the Facilitator will need to demonstrate the ability to work with the two programs' diverse stakeholders and audiences.

The creation of a Cooperative Agreement (CA) for a new Facilitator for Polar STEAM will 1) resume the AAW program; 2) expand the reach of the educators' program to include faculty from community colleges and Minority Serving Institutions; 3) help integrate both programs with the work of the OPP and EHR programs; 4) foster collaboration and coordination between the participants, i.e., artists, writers, educators and researchers; and 5) broaden the public impact of Polar STEAM.

In response to this solicitation, NSF seeks proposals from a broad representation of PIs and institutions, including a geographically diverse set

of institutions (including those in EPSCoR jurisdictions) and PIs who are women, early-career researchers, members of underrepresented groups, veterans, and persons with disabilities.

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.

- Elizabeth L. Rom, telephone: (703) 292-7709, email: polarsteam@nsf.gov
- Valentine H. Kass, telephone: (703) 292-5095, email: polarsteam@nsf.gov

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

- 47.050 --- Geosciences
- 47.076 --- Education and Human Resources

Award Information

Anticipated Type of Award: Cooperative Agreement

Estimated Number of Awards: 1

One award for Facilitator Support Office. Amount is anticipated to be up to \$700,000/year for each year of 5-year performance period. Additional, specific costs during the performance period will be considered based on essential, supplemental efforts identified in approved Annual Work Plans.

Anticipated Funding Amount: \$3,500,000 to \$4,000,000

Estimated award up to \$3,500,000-\$4,000,000 (up to \$700,000 per year) over the five-year period of performance of the Cooperative Agreement, subject to the availability of funds

Eligibility Information

Who May Submit Proposals:

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 US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- For-profit organizations: U.S. commercial organizations, especially small businesses with strong capabilities in scientific or engineering research or education.
- Other Federal Agencies and Federally Funded Research and Development Centers (FFRDCs): Contact the appropriate program before preparing a proposal for submission.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization: 1

Limit on Number of Proposals per PI or co-PI: 1

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 FastLane: *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=papppg.
 - 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:**

Not Applicable

C. Due Dates

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

February 25, 2022

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review criteria apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions:

Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements:

Additional reporting requirements apply. Please see the full text of this solicitation for further information.

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I. INTRODUCTION

The Office of Polar Programs (OPP) of the National Science Foundation (NSF) supports a broad portfolio of creative and innovative scientific research, engineering, and education in and about the polar regions, catalyzing fundamental discovery and understanding of polar systems and their global interactions to inform the nation and advance the welfare of all people. OPP supports world-class Arctic and Antarctic science through grants to researchers across the U.S. and provides polar facilities and logistical support for that research.

The mission of the Education and Human Resources Directorate (EHR) is to achieve excellence in U.S. science, technology, engineering, and mathematics (STEM) education at all levels and in all settings (both formal and informal) in order to support the development of a diverse and well-prepared workforce and well-informed citizenry that have access to the ideas and tools of STEM.

Given their respective missions, OPP and EHR have traditionally collaborated to enhance both formal and informal polar education.

https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf19086 For decades, OPP managed the Antarctic Artists and Writers (AAW) program to support

writing and artistic projects specifically designed to increase the public's understanding and appreciation of the Antarctic and the human endeavors on the southern continent. The AAW program was paused in 2020, in order to assess the best way to move the program forward.

OPP and EHR have also supported sending educators, both formal and informal, to both the Antarctic and Arctic to work collaboratively with researchers. As a unique professional development opportunity, this effort benefitted not only the individual educators but also the diverse communities they have served. NSF is coalescing the management of these programs, under the name "Polar STEAM," in order to strengthen both programs and build synergies between them. Polar STEAM will promote diversity, equity and inclusion and allow for participation by a broader range of educators. Incorporating Art into STEM learning experiences (commonly referred to as STEAM, e.g., Science, Technology, Engineering, Arts, Mathematics) allows students of all ages to access science concepts from different vantage points, promotes creative thinking, speaks to a broader swath of learners, and enhances engagement and understanding.

With the establishment of the Facilitator for Polar STEAM, NSF is instituting a new model of program management for the two constituent initiatives (AAW and Polar Educators). Given the substantial involvement NSF will have in the work of the Facilitator, this award will be made as a Cooperative Agreement. The creation of a Cooperative Agreement (CA) for a new Facilitator for Polar STEAM will 1) resume the AAW program; 2) expand the reach of the educators' program to include faculty from community colleges and Minority Serving Institutions; 3) help integrate both programs with the work of the OPP and EHR programs; 4) foster collaboration and coordination between the participants, i.e., artists, writers, educators, and researchers; and 5) broaden the public impact of Polar STEAM. These goals are in alignment with NSF's Strategic Plan to expand knowledge in science, engineering, and learning; to broaden participation in STEM; and push the frontiers of discovery and innovation. *Building the Future: Investing in Discovery and Innovation, NSF Strategic Plan for Fiscal Years (FY) 2018-2022*, NSF 18-045, https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf18045

NSF anticipates entering into this Cooperative Agreement for a period of five years. Annual Reviews will be conducted in addition to a comprehensive Management Review after the first three years of Awardee performance. Results of the latter review, in combination with demonstration of continuing community need, will guide a decision to re-compete or renew the Cooperative Agreement for a second five-year period, with renewal also contingent on submission of a meritorious proposal. https://www.nsf.gov/pubs/policydocs/pappg20_1/index.jsp

II. PROGRAM DESCRIPTION

General

The Facilitator of Polar STEAM will be responsible for creating programs that support the inclusion of educators in NSF-funded scientific research programs in the Arctic and the Antarctic and that support the access of artists and writers to NSF-funded scientific facilities and research activities in the Antarctic. An overarching goal of the initiative is to reach diverse audiences with information, materials, resources, and events that inspire and engage students and the general public with the NSF-supported scientific research underway in the Arctic and Antarctic.

The Facilitator will be responsible for supporting educators, artists and writers who wish to apply to the programs by answering all inquiries about the programs during the application process, developing an online application system, communicating with NSF science and logistic program officers and logistics contractors to ensure the suitability of applications, and creating a review and ranking process for the applications. The Facilitator will also be responsible for communicating with and recruiting NSF-funded scientists who will host educators, artists and writers as participants in their field teams.

The Facilitator will select approximately twelve educators for participation in the program each year, with roughly half of the total being faculty from community colleges or Minority Serving Institutions (MSI) that are also Primarily Undergraduate Institutions, and the other half being informal science educators or teachers from middle and high schools. NSF will have final review and approval of all participants. Educators will be matched with researchers for field projects, and each year on average about half of the projects should be conducted in the Arctic and half in the Antarctic. Final totals will depend on the researchers who apply, the educators who apply and logistical constraints of the proposed field activities.

The Facilitator will also develop a process to support an additional 6-12 educators annually who wish to participate virtually in a project with a polar scientist. Some in-person events may be included in this program, such as workshops or classroom visits by the researcher(s), but there will be no field-work participation by the educator. The Facilitator will create and implement a recruitment plan that encourages applications from participants who are unable to travel and/or conduct fieldwork, including those who are physically unable to conduct fieldwork or who teach students with physical disabilities. The program may also include matches with polar scientists who do not conduct fieldwork, but who can provide access to polar data that students can analyze for classroom projects.

In addition to educators who participate in-person and virtually, the Facilitator will select and support up to 4 artists and/or writers to work in Antarctica each year. Final totals will depend on the artists who apply and logistical constraints of the proposed field activities. NSF will have final review and approval of participants.

Once participants are selected the Facilitator will be responsible for preparing participants to work with the scientists and/or for deployments, developing outreach events and communication channels that participants can use during deployments/projects, supporting outreach and promotion of participants ongoing collaborations via social media, and archiving project outcomes.

The Facilitator will develop an online application process for NSF-funded researchers seeking to include a STEAM participant in their research teams during deployments and fieldwork. The Facilitator is responsible for matching the scientists to participants and supporting activities that help participants and scientists develop working relationships prior to deployment, supporting communications and outreach of the team during deployment and supporting outreach events post-deployment. Scientists who wish to participate in the virtual program will also be selected and matched to participants in the virtual program. The Facilitator will provide support for the virtual scientist-educator teams to ensure successful collaborations. Finally, the Facilitator is responsible for enabling an evaluation of the project management and for developing metrics and collecting data that can be used to assess the impact of the program on the participants, including the scientists, as well as the educators', artists' and writers' target audiences and the general public, as appropriate.

This program will be supported as a Cooperative Agreement with the National Science Foundation (NSF). NSF will conduct annual reviews of budgets and will organize a mid-term review of the project during Year 3. Annual Facilitator budgets will be determined based on the final number of expected Polar STEAM participants and anticipated activities for the year.

Key Budget Issues

Transportation expenses for all participants to and from their home in the U.S. to Antarctica will be provided by the USAP Antarctic contractor. The Antarctic contractor also covers all expenses for participants once they are in Antarctica. All other travel expenses, such as per diem for hotels, transfers, and meals needed during transit to the departure point for Antarctica (Punta Arenas, CH or Christchurch, NZ) are the responsibility of the Facilitator.

Travel expenses for participants going to and from their home to a logistical hub in the Arctic are the responsibility of the Facilitator. From the hub location (e.g., Fairbanks, Alaska or Scotia, New York) the Arctic logistics contractor may cover transportation and shelter (tents or housing) and food, while the participant is working with the research team at the field site. The Facilitator needs to pay for food/per diem while participants are travelling.

Cold-weather gear, such as outerwear and boots, is provided by the Arctic logistics contractor for work at sites on the Greenland icesheet and by the USAP contractor for fieldwork in the Antarctic. Elsewhere in the Arctic, program participants will need to provide their own field attire including footwear and outerwear. Prospective PIs should request a scope and cost letter from the Arctic Research Support and Logistic contractor (<https://batellearcticgateway.org>) by emailing arctic.planning@batelle.org.

Educator's home institutions are expected to maintain salary and benefits for the participants, and a letter of support from an academic administrator is required. Support for substitute teachers and/or adjunct professors who will cover classes and courses during a participant's deployment will be provided by the Facilitator for deployments that overlap with the academic schedule.

Specific Tasks

The Facilitator will serve as the principal liaison between educators, artists and writers and the NSF. In this capacity, the Facilitator will provide administration management, oversee communications and outreach activities, and track and document data to monitor and evaluate Polar STEAM. Specific tasks will include (but are not limited to):

Administration Management

1. Develop and manage a website with web-based application processes for: 1) educators who may be middle or high school teachers, informal science educators, or faculty at Minority Serving Institutions and community colleges, 2) artists and writers and 3) scientists who wish to work with educators, artists or writers.
2. Develop and manage an annual process for review and selection of educators who wish to embed with a polar research team conducting field research in either the Arctic or Antarctic and for educators who wish to participate virtually.
3. Develop and manage an annual process for review and selection of artists and writers who will travel to Antarctic stations, facilities, or field sites to conduct research for their proposed creative work.
4. Develop and manage a process for matching educators, artists, and writers with researchers who will include them in field programs, training participants in media and outreach techniques that are appropriate for polar fieldwork, host workshops to ensure that educators, artists, writers, and researchers develop a working relationship prior to deployment and arrange for field safety training prior to deployment, including training for the prevention of harassment in field settings.
5. Develop protocols for the virtual participation of educators.

Communications and Outreach

6. Respond to and track all inquiries from individuals and organizations about the program.
7. Interface with NSF science and logistic program officers who will consult with support contractors to assess the feasibility of the highly competitive projects during the final selection process.
8. Provide support to participants as they interface with Arctic and Antarctic logistical support contractors who provide travel and logistical support in the field.
9. Facilitate efforts required to obtain authorizations and permits, if needed, for work in the Arctic and Antarctic. Guide participants who are deploying to Antarctica or the Greenland Ice Sheet through the Physical Qualification (PQ) process.
10. Assist participants who may be required to submit environmental compliance and safety documentation.
11. Develop and maintain a website that provides participants with connections to audiences in the US while they are deployed, organize online events that highlight their work during and after deployment and that offer the public access to lesson plans and other polar resources developed by participants.
12. Provide travel support for participants to attend one post-deployment meeting, conference, or exhibition in the U.S. to present their work.

Monitoring and Evaluation

1. Evaluate the program to determine: 1) participant satisfaction with program implementation, including separate assessments of the educators, scientists and artists and writers, 2) documentation of collaborative efforts between participants and scientists, 4) success of efforts to recruit and select a diverse group of participants, 5) documentation of efforts to build synergies between the educators and artists and writers and to increase the public's awareness and engagement with the program.
2. Maintain regular reporting schedules to NSF program officer(s) who will provide final review and approval of the list of participants and projects.
3. Plan and budget for an annual Reverse Site Visit.
4. Develop Annual Work Plans (AWPs) that detail specific activities and estimated costs for each year of Awardee performance. Provide Interim Reports quarterly and Annual Reports that describe progress and associated cost in achieving efforts identified in the respective AWP. Provide additional reporting as described in Section VII.c. below.

Other

NSF welcomes creative ideas to further enhance the Broader Impacts of Polar STEAM.

III. AWARD INFORMATION

Estimated award up to \$3,500,000-\$4,000,000 over the five-year period of performance of the Cooperative Agreement, subject to the availability of funds.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

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 US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- For-profit organizations: U.S. commercial organizations, especially small businesses with strong capabilities in scientific or engineering research or education.
- Other Federal Agencies and Federally Funded Research and Development Centers (FFRDCs): Contact the appropriate program before preparing a proposal for submission.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization: 1

Limit on Number of Proposals per PI or co-PI: 1

Additional Eligibility Info:

Collaborations and partnerships are encouraged, however **in the case of proposals involving multiple organizations, a single organization must be identified as the lead, and a single proposal describing the entire project must be submitted by that organization.** Funds may be distributed among partner organizations via subawards from the lead organization. Consortia members may not submit separate proposals.

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 FastLane or Grants.gov.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal & Award Policies & 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. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- 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.C.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.

In addition to the requirements for Sections of the Proposal described in PAPPG Chapter II.C.2, the **Project Description** shall include the following specific information:

- Describe the overall approach for providing a cost-effective program that will support educators who apply to work in the Arctic or Antarctic with polar researchers, educators who wish to participate virtually, and artists and writers who apply to work at NSF-supported facilities in Antarctica.
- Thoroughly address the experience, expertise, and capability of the proposer to perform the specific tasks listed in Section II of this solicitation.
- Explain the project's management plan to demonstrate that the project team and partners will work collaboratively to achieve project outcomes.
- Emphasize proposer's understanding of U.S. middle and high school educator requirements, faculty requirements at U.S. community colleges and Minority Serving Institutions that are also Primarily Undergraduate Institutions, and best practices in informal science education.
- Emphasize proposer's understanding of and connections to the broad cross-section of disciplines within the arts and humanities.
- Discuss plans for recruiting highly qualified and committed participants and how the program can build synergies between the cohorts to expand and enhance the impact of the program.
- Describe how the Facilitator will work to achieve the NSF priority goal of Broadening Participation through this work.
- Proposers should demonstrate understanding of logistical constraints, regulatory and environmental considerations, and the capability to successfully support participants to travel to and work in the Arctic and Antarctic.
- Delineate a timeline for the program that includes a cycle of applications, review, selection, and preparation for new participants as well as ongoing support for current participants and past participants.
- Delineate a Work Breakdown Structure that ties schedule milestones to major budget elements.
- Describe plans for project assessment.

The Project Description is limited to no more than 25 pages.

Resources

The following sites are potential resources for prospective PIs:

- For information about the NSF Office of Polar Programs: www.nsf.gov/geo/opp/about.jsp.
- For information about the US Antarctic Program (USAP): www.usap.gov.
- For information about Navigating the New Arctic, one of NSF's 10 Big Ideas, visit the Navigating the New Arctic Community Office www.nna-co.org.
- For information about Arctic logistics, see NSF's prime contractor for Arctic field research support website: <https://battelearcticgateway.org>, or email Battelle Arctic at arctic.planning@battelle.org.
- For information about PolarTREC (Teachers and Researchers Exploring and Collaborating): www.polartrec.com
- Polar Educators International (PEI) <https://polareducator.org>
- Association of Polar Early Career Scientists (APECS) <https://www.apecs.org>
- The Polar Impact Network: www.polarimpactnetwork.org.
- The Center for Advancement of Informal Science Education (CAISE) is a cooperative agreement with the NSF AISL program designed to strengthen the field of informal STEM education and its infrastructure. See www.informalscience.org for more information.
- The Community for Advancing Discovery Research in Education (CADRE) is the resource network for the DRK-12 program. CADRE's mission is to support and connect researchers and developers in K-12 STEM education. See www.cadrek12.org for more information.
- Antarctic Artists and Writers Collaborative: www.aawcollective.com

NSF INCLUDES is one of the NSF 10 Big Ideas. For the U.S. to remain the world leader in STEM innovation and discovery, it must identify and develop talent from all sectors. For more information, see the NSF INCLUDES Coordination Hub and National Network: <http://includesnetwork.org>.

References

Journal of Geoscience Education, Volume 69, 2021 – Issue 2: The Imperative for Polar Education.

Committee on Equal Opportunities in Science and Engineering (CEOSE). Investing in Diverse Communities, 2017-2018 Biennial Report to Congress. [CEOSE | Biennial Report to Congress 2017-2018 \(nsf.gov\)](#).

National Academies of Sciences, Engineering, and Medicine. 2019. Minority Serving Institutions: America's Underutilized Resource for Strengthening the STEM Workforce. Washington, D.C.: The National Academies Press. <https://doi.org/10.17226/25257>.

Community College Review, Understanding Determinants for STEM Major Choice Among Students Beginning Community College

Colleen A. Evans, Rong Chen, Ryan P. Hudes, First Published June 5, 2020 <https://doi.org/10.1177/0091552120917214>

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

C. Due Dates

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

February 25, 2022

D. FastLane/Grants.gov Requirements

For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the NSF Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The NSF Help Desk answers general technical questions related to the use of the FastLane and Research.gov systems. 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 the NSF FastLane system for further processing.

Proposers that submitted via FastLane 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 *Building the Future: Investing in Discovery and Innovation - NSF Strategic Plan for Fiscal Years (FY) 2018 – 2022*. 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.C.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.C.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.

Additional Solicitation Specific Review Criteria

For this solicitation, the following additional specific review criteria will be applicable:

The capability and qualifications of the proposed organization to manage and execute program requirements including knowledge of (1) the U.S. middle and high schools educator requirements, (2) faculty requirements at U.S. community colleges and Minority Serving Institutions that are Primarily Undergraduate Institutions, (3) best practices of informal science education, and (4) understanding of and connections to the broad cross-section of disciplines within the arts and humanities.

Ability of proposing team to promote diversity, equity, and inclusion, ideally in STEAM and/or polar sciences, that includes a background of prior work leading to increased participation by under-represented groups and/or diverse audiences.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by 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 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 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 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.

Special Award Conditions:

The award associated with this solicitation will be a Cooperative Agreement, not a standard grant, that will fund the Facilitator of Polar STEAM in accordance with approved Annual Work Plans. Annual Work Plans must be provided within 120 days of the new award period. Any special requirements not stated herein will be negotiated at the time of award. Cooperative Agreements include substantial involvement of the Government, particularly in oversight of award performance. The following are some of the measures NSF uses to conduct oversight:

- Review of Quarterly and Annual Reports, Annual Work Plans, and Performance Metrics,
- Site visits, or Reverse Site Visits, annually or as necessary.
- Review/approval of subawards.
- Review of management performance and operation activities approximately midway through the initial five-year award.
- Websites, lesson plans and other educational materials developed as part of this project are subject to transfer to a new Facilitator if the original Cooperative Agreement is not renewed.
- The awardee will comply with the OPP Code of Conduct, the OPP Safety Policy, the Principles for Conducting Research in the Arctic, and abide by all other policies in place at research locations and by NSF or the research support contractors in the Arctic and Antarctic.

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.

1. The Awardee will submit Annual Work Plans to NSF with budgets for support of the Facility Support Office and baseline operations.
2. The Awardee will provide quarterly Interim Reports to NSF in addition to the Annual Reports noted previously.
3. The Awardee will provide regular informal reporting including communications with the NSF Program Officers, as appropriate.
4. The Awardee's annual and final reports to NSF will include data with respect to the Facilitator's activities as well as data on the participants' activities and outcomes.
5. News releases and other similar items prepared by the Awardee and/or its subcontractors/employees that describe activities or research results will be submitted for NSF review at least two days prior to proposed publication and will acknowledge the sponsorship of the NSF. Public information brochures, and other related material prepared by the Awardee, including World Wide Web pages, will be sent to the NSF before being made available to the public.

Acknowledgement of Support

An acknowledgement of NSF support and disclaimer must appear in any publication of any material based upon or developed under this award in substantially the following terms:

"The Facilitator of Polar STEAM is sponsored by the National Science Foundation under Grant No. (Grantee enters NSF grant number.) Any opinions, findings and conclusion or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation." (The preceding sentence may be omitted from scientific articles or papers published in scientific journals, although such articles should acknowledge NSF grant support.) Also, support of other agencies or contributors shall be acknowledged as appropriate.

Grantee also will be required to orally acknowledge NSF support using the language specified above during all new media interviews, including popular media

such as radio, television, and news magazines.

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:

- Elizabeth L. Rom, telephone: (703) 292-7709, email: polarsteam@nsf.gov
- Valentine H. Kass, telephone: (703) 292-5095, email: polarsteam@nsf.gov

For questions related to the use of FastLane or Research.gov, contact:

- FastLane and Research.gov Help Desk: 1-800-673-6188
- FastLane Help Desk e-mail: fastlane@nsf.gov.
- 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.E.6 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
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