

NSF 21-595: Tribal Colleges and Universities Program (TCUP)

Program Solicitation

Document information

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National Science Foundation

Directorate for STEM Education

Division of Equity for Excellence in STEM

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

October 15, 2021

Instructional Capacity Excellence in TCUP Institutions (ICE-TI)

October 15, 2021

Targeted STEM Infusion Projects (TSIP)

December 01, 2021

TCUP for Secondary and Elementary Teachers in STEM (TSETS)

January 04, 2022

January 4, Annually Thereafter

Small Grants for Research (SGR)

April 01, 2022

April 1, Annually Thereafter

Targeted STEM Infusion Projects (TSIP)

April 01, 2022

April 1, Annually Thereafter

Instructional Capacity Excellence in TCUP Institutions (ICE-TI) and Targeted STEM Infusion Projects (TSIP)

June 01, 2022

June 1, Annually Thereafter

TCU Enterprise Advancement Centers (TEA Centers)

September 01, 2022

September 1, Annually Thereafter

TCUP for Secondary and Elementary Teachers in STEM (TSETS)

January 11, 2023

January 11, Annually Thereafter

Small Grants for Research (SGR)

September 03, 2024

TCUP for Secondary and Elementary Teachers in STEM (TSETS)

Submission Window Date(s) (due by 5 p.m. submitter's local time):

October 15, 2021 - October 14, 2022

October 15 - October 14, Annually Thereafter

TCUP Partnerships; Cyberinfrastructure Health, Assistance, and Improvements (CHAI); Preparing for TCP Implementation (Pre-TI)



Table Of Contents

[Summary of Program Requirements](#)

[I. Introduction](#)

[II. Program Description](#)

[III. Award Information](#)

[IV. Eligibility Information](#)

[V. Proposal Preparation and Submission Instructions](#)

[A. Proposal Preparation Instructions](#)

[B. Budgetary Information](#)

[C. Due Dates](#)

[D. Research.gov/Grants.gov Requirements](#)

[VI. NSF Proposal Processing and Review Procedures](#)

[A. Merit Review Principles and Criteria](#)

[B. Review and Selection Process](#)

[VII. Award Administration Information](#)

[A. Notification of the Award](#)

[B. Award Conditions](#)

C. Reporting Requirements

VIII. Agency Contacts

IX. Other Information

Important Information And Revision Notes

Important Information

Innovating and migrating proposal preparation and submission capabilities from FastLane to Research.gov is part of the ongoing NSF information technology modernization efforts, as described in [Important Notice No. 147](#). In support of these efforts, research proposals submitted in response to this program solicitation must be prepared and submitted via Research.gov or via Grants.gov, and may not be prepared or submitted via FastLane.

Revision Notes

A new funding track, TCUP Partnerships, modeled on prior partnership strands (e.g., PEEC, PAGE, PADLE), enables collaborations between and among TCUP institutions and non-TCUP institutions in any NSF-eligible discipline (support for non-TCUP institutions is not available through TCUP; therefore, participation from other NSF programs is required). Additional limitations are described within this solicitation.

A new funding track, TCUP for Secondary and Elementary Teachers in STEM (TSETS), is offered to extend the impact of TCUP institutions' science, technology, engineering, or mathematics (STEM) instructional and research capacity to the K-12 STEM educational enterprise. Description and limitations of the TSETS track are described within.

A new funding track, Cyberinfrastructure Health, Assistance, and Improvements (CHAI), will provide modest support for cyberinfrastructure components needed to provide and manage STEM programs of study and research. Limitations are described within.

Depending on the specific program track, proposals will be submitted in response to a published deadline or accepted anytime as detailed within the solicitation.

The strand Partnerships in Geosciences Education (PAGE) has been removed and the activities it comprised are now eligible for support through TCUP Partnerships.

The strand Partnerships for Documentary Linguistics Education (PADLE) is no longer described but is still available through the program NSF Dynamic Language Infrastructure - NEH Documenting Endangered Languages (DLI-DEL); see https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505705.

The strand SEA-PHAGES in TCUs has been removed.

The institutional eligibility section has been edited to clarify determination of eligibility.

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

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:

Tribal Colleges and Universities Program (TCUP)

Synopsis of Program:

The Tribal Colleges and Universities Program (TCUP) provides awards to federally recognized¹ Tribal Colleges and Universities, Alaska Native-serving institutions, and Native Hawaiian-serving institutions to promote high quality science (including sociology, psychology, anthropology, linguistics, economics and bio-economics, statistics, and other social and behavioral sciences; natural sciences; computer science, including, but not limited to, artificial intelligence, quantum information science, and cybersecurity), technology, engineering and mathematics (STEM), STEM education, research, and outreach. Support is available to TCUP-eligible institutions (see the Additional Eligibility subsection of Section IV of this solicitation) for transformative capacity-building or community engagement projects through **Instructional Capacity Excellence in TCUP Institutions (ICE-TI)**, **Targeted STEM Infusion Projects (TSIP)**, **TCUP for Secondary and Elementary Teachers in STEM (TSETS)**, **TCU Enterprise Advancement Centers (TEA Centers)**, **Cyberinfrastructure Health, Assistance, and Improvements (CHAI)**, and **Preparing for TCUP Implementation (Pre-TI)**. Collaborations led by TCUP institutions that involve non-TCUP institutions of higher education are supported through **TCUP Partnerships**, with the participation of other NSF programs to support the work of non-TCUP institutions. Finally, research studies that further the scholarly activity of individual faculty members are supported through **Small Grants for Research (SGR)**. Through the opportunities highlighted above, as well as collaborations with other National Science Foundation (NSF) divisions and directorates, and other organizations, TCUP aims to increase Native individuals' participation in STEM careers, improve the quality of STEM programs at TCUP-eligible institutions, and facilitate the development of a strong STEM enterprise in TCUP institutions' service areas.

TCUP supports transformative capacity-building, community engagement, or research projects at TCUP-eligible institutions through the following funding tracks:

Instructional Capacity Excellence in TCUP Institutions (ICE-TI) projects provide support to design, implement, and assess comprehensive institutional improvements in STEM education and research capacity at TCUP-eligible institutions of higher education. By strengthening STEM education and STEM education research, successful projects will increase the number of STEM students and improve the quality of their preparation. ICE-TI projects create and/or adapt and assess innovative models and materials for teaching and learning in STEM, embody knowledge about how students learn most effectively in STEM teaching and learning activities, and bring STEM disciplinary advances into the undergraduate or graduate experience. The objective of this strand is to expand STEM degrees offered by TCUP-eligible institutions or significantly enhance instructional approaches.

Targeted STEM Infusion Projects (TSIP) support the attainment of a short-term, well-defined goal to improve the quality of STEM education at an eligible institution. Targeted STEM Infusion Projects could, for example, enhance academic infrastructure by systematically adding traditional knowledge to the scope or content of a STEM course, updating curricula, modernizing laboratory research equipment, developing and delivering professional development for K-12 STEM educators, or improving the computational infrastructure. The objective of this strand is to expand STEM degrees or significantly enhance instructional approaches.

TCUP for Secondary & Elementary Teachers in STEM (TSETS) supports in-service professional development in STEM disciplinary or STEM education content and/or research for K-12 STEM teachers in the relevant service area. Examples of project activities include, but are not limited to, professional development involving seminar series and engagement in STEM instruction and content during the academic year, structured series of summer intensive workshops and trainings, and summer research opportunities. The objective of this strand is to broaden the instructional capacity for STEM in the K-12

workforce and thereby to the entire community, and to build the capacity for STEM disciplinary or education research among participating educational professionals.

TCU Enterprise Advancement Centers (TEA Centers) coalesce the STEM and/or STEM education expertise into a team, designed to support and promote the STEM goals, needs, aspirations, or interests of the chartering reservation or tribe(s). TEA Centers may address a critical tribal or community need or focus on a realm of research or design that is beyond the scope of individual research grants or that is of interest to multiple tribes. The objective of this strand is to build on the capacity developed through prior TCUP support and apply expertise to collaborations with communities in the institution's service area, or nationally.

The **Cyberinfrastructure Health, Assistance, and Improvements (CHAI)** strand supports projects at TCUP-eligible institutions of higher education to upgrade the cyberinfrastructure necessary to conduct, expand, manage and administer STEM programs of study, including research. The objective of this strand is to equip TCUP institutions to meet the demands of virtual instruction, advanced computing, and data science opportunities.

Preparing for TCUP Implementation (Pre-TI) provides support for activities that prepare an institution for Implementation-level projects. Consequently, they are available only to TCUP-eligible institutions of higher education that have never received TCUP support, have not received TCUP support within the previous five years, or are embarking on a significantly novel STEM strategic plan. Examples of supported activities include completing an institutional assessment of its current STEM instructional capacity, or engaging in conversations necessary to formulate a shared vision of what that capacity should be and how to achieve it. Pre-TI awards can support staff and faculty release time, travel, stakeholder gatherings, and associated administrative costs. The objective of this strand is to conduct self-studies and formulate strategic plans for the development of STEM instructional programs of study.

The **TCUP Partnerships** strand provides support for collaborations that will improve TCUP institutions' instructional and research capacity in STEM fields supported by NSF; attract, retain, and support TCUP students in internships and research endeavors deemed to be necessary for a complete curriculum offering; and engage partner universities to provide an academic grounding and a successful transition for students who wish to study or attain degrees in STEM fields supported by NSF. TCUP Partnerships broaden the number of scientific disciplines available to students at TCUP institution through collaborations with non-TCUP institutions. Active Pre-Engineering Education Collaboratives or Partnerships in Geoscience Education awards are not affected by this revision. The objective of this strand is the development, through instructional and research capacity-building, of academic and career pathways for TCUP students through supporting collaborative projects between and among TCUP and non-TCUP institutions. Interested teams of collaborators for which a TCUP institution serves as lead should contact the TCUP program directors. Support for non-TCUP partners must be obtained from other NSF programs, which follows the procedures of the prior Partnership strands.

Small Grants for Research (SGR) strand support STEM or STEM Education faculty members at TCUP-eligible institutions to initiate or pursue research projects or programs that may include undergraduate or graduate student engagement. Awards are intended to help further the faculty member's research capability and effectiveness; improve research and teaching at his or her home institution; create and study new models and innovations in STEM teaching and learning; and enhance the understanding of diverse groups' participation in STEM education practices and interventions. International research or collaborations are strongly encouraged. TCUP students may seek support for international research opportunities under the guidance of a TCUP STEM or STEM education faculty member and an international research collaborator. These awards are particularly appropriate as a means of recruiting and retaining highly qualified scientists, engineers, and educators at TCUP-eligible institutions. The objective of this strand is to support faculty research and professional development that build research capacity at TCUP institutions.

¹ Executive Order 13021 defines Tribal Colleges and Universities ("tribal colleges") as those institutions cited in section 532 of the Equity in Educational Land-Grant Status Act of 1994 (7 U.S.C. 301 note), and other institutions that qualify for funding under the Tribally Controlled Community College Assistance Act of 1978, (25 U.S.C. 1801 et seq.), as well as Navajo Community College as authorized in the Navajo Community College Assistance Act of 1978, Public Law 95-471, Title II (25 U.S.C. 640a note). The term "Alaska Native-serving institution" means an institution of higher education that is an eligible institution under section 1058(b) of the Higher Education Act; and that, at the time of submission, has an undergraduate enrollment that is at least 20 percent Alaska Native students. The term "Native Hawaiian-serving institution" means an institution of higher education that is an eligible institution under section 1058(b) of the Higher Education Act; and that, at the time of submission, has an undergraduate enrollment that is at least 10 percent Native Hawaiian students. Most TCUP-eligible institutions of higher education are two-year or community colleges. See the Who May Submit Proposals section in this solicitation for further details.

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.

- Jody Chase, Program Director, TCUP, telephone: (703) 292-8640, email: ljchase@nsf.gov
- Jeremy Guinn, Program Director, TCUP, telephone: (703)-292-8193, email: jguinn@nsf.gov
- Regina Sievert, Program Director, TCUP, telephone: (703) 292-2808, email: rsievert@nsf.gov
- Nicole Gass, Program Specialist, telephone: (703) 292-8378, email: ngass@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: 17 to 55

Up to 6 ICE-TI awards will be made pending the availability of funds. Up to 10 TSIP awards, up to 5 TSETS awards, up to 10 Small Grants for Research, and up to 3 Pre-TI awards will be made pending the availability of funds. Up to 3 TCUP Partnership collaborative awards will be made pending the availability of funds; other NSF programs may provide support for non-TCUP-eligible institutions. Up to 8 TEA Centers awards will be made pending the availability of funds. Up to 10 CHAI awards will be made pending the availability of funds.

Anticipated Funding Amount: \$10,799,836

Approximately \$10,300,000 for TCUP ICE-TI, TSIP, TSETS, TEA Centers, CHAI, Pre-TI, TCUP Partnerships, and SGR projects, pending availability of funds.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Organizations eligible to submit TCUP proposals are federally recognized Tribal Colleges and Universities, Alaska Native-serving institutions and Native Hawaiian-serving institutions. Multiple

campuses of one university system are normally encouraged to consider collaborative submissions. Executive Order 13021 defines Tribal Colleges and Universities ("tribal colleges") as those institutions cited in section 532 of the Equity in Educational Land-Grant Status Act of 1994 (7 U.S.C. 301 note), and other institutions that qualify for funding under the Tribally Controlled Community College Assistance Act of 1978, (25 U.S.C. 1801 et seq.), as well as Navajo Community College as authorized in the Navajo Community College Assistance Act of 1978, Public Law 95-471, Title II (25 U.S.C. 640a note). The term "Alaska Native-serving institution" means an institution of higher education that is an eligible institution under section 1058(b) of the Higher Education Act; and that, at the time of submission, has an undergraduate enrollment that is at least 20 percent Alaska Native students. The term "Native Hawaiian-serving institution" means an institution of higher education that is an eligible institution under section 1058(b) of the Higher Education Act; has a Carnegie classification of baccalaureate or associates college; and has, at the time of submission, an undergraduate enrollment that is at least 10 percent Native Hawaiian students. By signing and submitting the proposal, the proposer is certifying that they meet the eligibility criteria specified in this program solicitation. Willful provision of false information in this request and its supporting documents or in reports required under an ensuing award is a criminal offense (U.S. Code, Title 18, Section 1001). Eligibility may be verified by consulting the Integrated Postsecondary Education Data System (IPEDS) or other certified federal government data sources. Other institutions of higher education are eligible to submit collaborative proposals as non-leads with TCUP-eligible institutions under the TCUP Partnerships strands; limitations apply.

Who May Serve as PI:

For the Instructional Capacity Excellence in TCUP Institutions (ICE-TI), TCU Enterprise Advancement (TEA) Centers, and TCUP Partnerships award strands, the principal investigator (PI) is expected to be the president, chief academic officer, another senior academic officer responsible for oversight and management of curriculum and instructional policies for the institution, or a senior STEM faculty member. Typically, the PI for Targeted STEM Infusion Projects (TSIP) or TCUP for Secondary and Elementary Teachers in STEM proposals (TSETS) would be a member of the STEM faculty, but STEM education faculty are encouraged to be part of the key leadership team. The PI for Small Grants for Research (SGR) proposals should be the lead researcher and would typically be a member of the STEM or STEM education faculty. For Cyberinfrastructure Health, Assistance, and Improvements (CHAI), the PI should be a senior STEM faculty member, but the chief information officer (CIO) is strongly encouraged to be part of the key leadership team. Prospective PIs are encouraged to consult TCUP program staff.

Limit on Number of Proposals per Organization:

Eligible institutions may submit only one TEA Center proposal per year but may receive and administer concurrent awards. Preparing for TCUP Implementation (Pre-TI) awards are designed to support TCUP development activities for TCUP-eligible institutions that have received no prior TCUP support, no TCUP support within the previous five years, or are embarking on a significantly novel STEM strategic plan. No other restrictions apply.

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):

October 15, 2021

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October 15 - October 14, Annually Thereafter

TCUP Partnerships; Cyberinfrastructure Health, Assistance, and Improvements (CHAI); Preparing for TCP Implementation (Pre-TI)

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria apply.

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.

I. Introduction

The National Science Foundation (NSF) supports research at the frontiers of knowledge, across all STEM fields and all levels of STEM education. NSF enables innovation and discovery in STEM by educating and preparing a diverse STEM workforce motivated to participate at the frontiers of science and STEM industries. NSF is committed to ensuring that the rich diversity of the nation's cultures is well represented in the STEM workforce and that individuals engaged in STEM fields are trained to participate fully in the global research enterprise, as articulated in the National Science Board's Vision 2030.

To meet the challenges presented by the nation's increasing STEM needs, the Tribal Colleges and Universities Program is committed to enhancing the quality of STEM education and research at federally recognized Tribal Colleges and Universities, and Alaska Native-serving and Native Hawaiian-serving institutions that meet federal enrollment criteria for minority-serving status (please see eligibility section). TCUP seeks to support STEM education initiatives that prepare a STEM workforce that is broadly inclusive and capable of performing in an international research and development environment, thus ensuring that the U.S. remains a global STEM leader.

In alignment with the Directorate for STEM Education (EDU) and Division of Equity for Excellence in STEM (EES) goals, TCUP has the following funding priorities: successful advancement of students through critical transition points between

high school and college, between two-year and four-year programs or institutions, between undergraduate and graduate studies, and into the workforce; innovation in instruction and curriculum development; providing access to original STEM research experiences for TCUP students; and promoting STEM entrepreneurship and community collaborations. Proposals submitted to TCUP are encouraged to address one or more of these priorities.

TCUP is particularly interested in building knowledge in areas related to the following questions:

- How does cultural integration with the STEM curriculum affect student success?
- How does the engagement of discipline-specific research affect student success?
- How does increasing the level of inquiry-based instruction affect student success?
- What are the critical support services and how do they affect student success?
- How does faculty development affect sustainability of institutional transformation?

Improving student performance in science and mathematics requires an adequate supply of well-qualified STEM teachers, and community colleges play a vital role in preparing these teachers, particularly among under-served populations. TCUP strongly encourages PIs to address STEM teacher preparation at either the associate or baccalaureate level to help increase the number and quality of future science and mathematics teachers.

A focus of TCUP is the recruitment and retention of student veterans in STEM fields as a means to diversify and increase the STEM workforce. Proposals that recruit a cohort of student veterans and suggest strategies to retain them are strongly encouraged.

II. Program Description

Paul Boyer wrote in *Tribal Colleges Shaping the Future of Native America*, "tribal colleges provide essential services that enrich the communities surrounding them."² Since their founding, TCUs have provided their communities with essential services, including technical and vocational job skills training, lower-division liberal arts instruction, paraprofessional preparation, college preparation, educational support to pre-college students and teachers, informal instruction, baccalaureate degree programs of study, and graduate programs of study. TCUs are also incubators, repositories, and curators of culture, language, and history. They are the hub of STEM teaching, STEM research, and STEM education research that is important to Native communities, including environmental quality and food sovereignty. They are the focal points for STEM and are resources for tribal governments for environmental, technological, economic, and educational policy matters.

TCUP promotes continued quality and improvement in science (including sociology, psychology, anthropology, economics, statistics, and other social and behavioral sciences as well as natural science and education disciplines), technology, engineering and mathematics research, instructional, and outreach programs at Tribal Colleges and Universities, Alaska Native-serving institutions and Native Hawaiian-serving institutions.

TCUP support is available for projects that build capacity in instruction and research, or that build upon that capacity to partner with the community. TCUP allows proposers flexibility and creativity in the design of efforts to improve STEM education. Proposed activities should result from analysis of institutional needs, address institutional and NSF goals, and have the potential to result in significant and sustainable improvement of STEM programs. TCUP emphasizes the expansion of course and degree offerings; development of research opportunities, faculty skills, and STEM-education technologies; and the integration of community goals and traditional knowledge with mainstream STEM education and research. Partnerships among institutions of higher education and collaborations with K-12 schools, tribal government units, or other relevant groups are encouraged.

The mission of TCUP from its inception has been to build capacity for improved STEM instruction or increased STEM instructional capacity, including curricular offerings, in TCUP Institutions. NSF recognizes that the TCUP investment has created a pool of knowledge that includes such areas as the influences upon learning among indigenous populations and the effect of increasing STEM educational opportunities upon communities. The following funding strands are designed to meet specific needs of the TCUP STEM enterprise.

Instructional Capacity Excellence in TCUP Institutions (ICE-TI), TCUP's signature strand, provides support to design, implement, and assess comprehensive transformative institutional efforts to strengthen STEM education and research at eligible institutions. ICE-TI projects create and/or adapt and assess innovative models and materials for teaching and learning in STEM, embody knowledge about how students learn most effectively in STEM teaching and learning activities, and bring STEM disciplinary advances into the undergraduate or graduate experience. Projects that may result in new STEM degrees at the associate, baccalaureate, or master's levels are encouraged. Proposers are encouraged to analyze the STEM strengths and potential of the institution. Based on this analysis, they should design appropriate innovative educational strategies to increase the capacity and effectiveness of the institution to attract, retain, and educate students in STEM. The students should graduate prepared to enter the STEM workforce and/or pursue further study at the baccalaureate or graduate level.

Dissemination of successful models, effective methods, and innovative materials for educating STEM students are critical aspects of ICE-TI projects. Activities that include pre-college students and educators, particularly those designed to improve interest in and readiness for post-secondary STEM studies, are particularly encouraged. Such activities include efforts to improve the transition from pre-college to undergraduate studies, such as structured series of summer intensive activities and projects, out-of-school enhancement activities, dual-credit projects between TCUP institutions and their area high schools, and in-service training for education professionals.

Previous TCUP support has resulted in significant development of STEM instructional capacity, and institutions that have received multiple TCUP implementation awards have benefited from the multiplier effect of that funding. Thus, the program encourages new proposals that capitalize upon the previous investments to establish new inquiries that can lead to discovery critical to and unique to TCUP communities. Such areas of investigation may include research on factors that affect the reservation or similar community, such as water and air quality, environmental variabilities, anthropological and paleontological artifacts, reintroduction and reestablishment of indigenous plants and animals, economics, and societal influences and impacts. It can also include long-term investigations into the role STEM education plays in unique populations of learners. Work conducted as a TCUP investigation must constitute original hypothesis-driven research. Successful proposals must articulate research questions that are relevant to the investigation and must include methods and metrics by which the questions will be studied. Proposals must include a dissemination plan that includes publication in peer-reviewed journals.

The **Targeted STEM Infusion Projects (TSIP)** strand provides support to achieve a short-term, well-defined goal to improve the quality of STEM education at eligible institutions. Targeted STEM Infusion Projects might develop innovative learning experiences in emerging fields of science and engineering and add traditional knowledge to the scope or content of STEM courses. Projects might develop creative uses of cyberinfrastructure for instruction in STEM and next generation STEM undergraduate or graduate programs, including artificial intelligence or industries of the future. Typically, projects are focused on one activity within a single STEM department; however, interdisciplinary and cross-disciplinary projects are encouraged. Projects that have an emphasis on the maker movement, including components necessary to create maker spaces (e.g., equipment, materials, supplies), are eligible activities for TSIP support. TSIPs are encouraged to include pre-college students when appropriate.

Competitive proposals will clearly describe the STEM education innovation that the project will realize. Appropriate short-term goals should be easily measurable by appropriate metrics and attainable within the project period.

TCUP for Secondary and Elementary Teachers in STEM (TSETS) - TSETS provides support for TCUP institutions to provide professional development for in-service K-12 STEM teachers practicing within a TCUP eligible institution's local service area. Project activities must include strong STEM content and concepts and may include (but not required) relevant pedagogy, for professional development that is provided during the academic year, summer intensive programs, summer research opportunities, or other means. To facilitate mutual peer mentoring, at least two teachers from each participating school should be included in the professional development. If two teachers from each school are not available, virtual mentoring arrangements can be supported if they are developed in advance and described in the proposal.

In addition to the common requirements for all TCUP proposals, TSETS Proposals must include the following:

- A plan for retaining each participant in the instructional training components for at least three years, although research opportunities can be designed and offered for shorter or fewer commitments,
- A project leadership team that includes at least three individuals, including a TCU STEM faculty member, a TCU education faculty member, and a local K-12 STEM teacher leader.

TSETS budgets may include the following:

- Teacher stipends, travel, equipment, and instructional materials.
- Equipment and instructional materials for training
- Support that enables on-line capability for participants as needed (e.g., laptops, software, mobile devices, data plans or internet connectivity).
- Support for project leadership teams and training consultants.
- Project evaluation may include measures of participant interest, such as persistence or continuation in the training opportunity, and should include a measure of enhancement of participant content knowledge or instructional practice. Evaluation may not include measures of impact on pre-college students.

TCUP Enterprise Advancement Centers (TEA Centers) - TEA Centers coalesce an institution's STEM and/or STEM education research expertise into a team, designed to support and promote the STEM goals, needs, aspirations, or interests of the chartering reservation, tribe(s) or local community. TEA Centers may address a critical tribal or community need or focus on a realm of STEM research or design that is beyond the scope of individual research grants or that is of interest to multiple tribes.

To enable TCUs' continued growth as intellectual resources for their communities and tribal governments, TCUP invites proposals for TEA Centers. These centers are envisioned as intellectual hubs on the STEM and STEM education specific interests or needs of the tribe or community that the TCU is best positioned to address. Those interests may be related to, for example, research in STEM disciplines supported by NSF, including environmental sciences, social and behavioral sciences, and engineering, as well as indigenous research, service learning, and STEM entrepreneurship.

TEA Centers will typically be organized to address a critical tribal or community STEM need and should include a strategic plan describing the need and the methodologies by which the need will be met. Centers may focus on a realm of STEM research that is beyond the scope of individual investigator grants or that is of interest to multiple tribes. Institutional research expertise will be required, although some capacity may be gained through the appointment of visiting faculty fellows.

TCUs that demonstrate significant STEM or STEM education research capacity may propose projects for up to five years of support. Such TEA Centers may be renewed based upon demonstration of adequate progress, discovery of new realms of opportunity not originally anticipated but still aligned with the original theme, and on-going commitment from the partnering tribal or community entities. The award can be used to support faculty, fellowships, visiting faculty, students, trainees, research materials and supplies, equipment, necessary travel, and other valid expenses. Construction of facilities typically will not be considered or supported, although modest renovations to STEM equipment and resources may be considered, in accordance with NSF guidelines.

Cyberinfrastructure Health, Assistance, and Improvements (CHAI) - Many STEM educational experiences require secure access to reliable high-speed internet and secure storage. To ensure that TCUP institutions can engage in STEM areas such as computational sciences and artificial intelligence, cyberinfrastructure must be enhanced. TCUP invites proposals from TCUP-eligible institutions of higher education to support the upgrading of cyberinfrastructure necessary to conduct, expand, manage, and administer STEM programs of study, including research. Through CHAI, support TCUP institutions can apply to purchase hardware and software needed for current STEM courses and programs, and to develop new ones. Eligible upgrades include but are not limited to: routers; firewalls; server blades; storage area networks; and smartboards or Wi-Fi-enabled equivalents.

A limited number of **Preparing for TCUP Implementation (Pre-TI)** projects will be funded to support activities that can ground an institution's readiness for implementation-level projects. Examples of activities include, but are not limited to, completion of an assessment of the institution's current STEM instructional capacity, or the conversations and consultations necessary to formulate a shared vision of what that capacity should be and how to achieve it. Provided

specifically for those TCUP-eligible institutions of higher education that have never received a TCUP implementation-level award, Pre-TI grants can support staff and faculty release time, travel, stakeholder gatherings, and associated administrative costs.

TCUP Partnerships - NSF continues to be committed to the work and success of TCUP institutions in providing their students with high-quality STEM instruction. That work and success can be enriched by collaborations with other institutions of higher education to enhance and extend the students' exposure to STEM. For example, successful partnerships can ensure the successful transition of students from one educational level to the next. As with all other TCUP funding opportunities, partnership proposals are encouraged to include tribal or Native pre-college students to the greatest practicable extent. An effective partnership might involve TCUP-eligible institutions in a region, and a university with strong regional ties to the TCUP institutions and that offers upper division or graduate coursework in STEM.

TCUP Partnerships seek to develop:

- TCUP institutions' capacity to provide STEM programs of study.
- Partnerships with universities to facilitate and improve the transfer and success of TCUP students seeking degrees in STEM.
- Outreach and support strategies at partner universities to improve access and success of TCUP students seeking degrees in STEM.

Proposals may be submitted collaboratively by a consortium of institutions, including TCUP and non-TCUP institutions. One TCUP institution must be identified to take the lead on organizational activities, although each institution will independently manage its award. Support of non-TCUP partners must be obtained prior to submission, as TCUP funds may not be subcontracted to non-TCUP institutions. Individuals interested in preparing a TCUP Partnership proposal should contact NSF program directors (TCUP and those in specific disciplinary programs) to ensure they understand the financial implications and limitations of these projects.

Small Grants for Research (SGR) - As the STEM instructional capacity of TCUP institutions increases, so does their stature in the research community. Research is encouraged in all TCUP proposals as appropriate. TCUP also offers funding to support research of STEM or STEM education faculty through Small Grants for Research (SGR). These awards support STEM or STEM education faculty members at TCUP-eligible institutions to initiate or pursue research endeavors in an NSF-supported STEM discipline or in STEM education. These activities can be centered at the PI's home institution, but may also involve activities at other locations, such as an NSF-funded Center, a research-intensive institution, or a national laboratory. SGR awards are intended to further the faculty member's research capability and effectiveness, to improve research and teaching at the PI's home institution, and may support students in research experiences.

² *Tribal Colleges Shaping the Future of Native America, A Special Report*, The Carnegie Foundation for the Advancement of Teaching, 1989.

III. Award Information

Instructional Capacity Excellence in TCUP Institutions (ICE-TI)

- Number of awards: Up to 6
- Project Length: Up to five years
- Award Size: Up to \$2.5 million
- Note: Funds should be budgeted for the PI and PD to attend a TCUP Leaders' Forum each award year.

Targeted STEM Infusion Projects (TSIP)

- Number of awards: Up to 10
- Project Length: Up to three years
- Award Size: Up to \$500,000
- Note: Funds should be budgeted for the PI to attend a TCUP Leaders' Forum each award year.

TCUP for Secondary and Elementary Teachers in STEM (TSETS)

- Number of awards: Up to 5
- Project Length: Up to five years
- Award Size: Up to \$1.75 million
- Note: Funds should be budgeted for the PI and PD to attend a TCUP Leaders' Forum each award year.

TCU Enterprise Advancement Centers (TEA Centers)

- Number of awards: Up to 8
- Project Length: Up to five years, with potential for renewal, as described in the Program Description section
- Award Size: Up to \$3.5 million, with potential for renewal, concomitant with scope of renewal
- Note: Funds should be budgeted for the PI and PD to attend a TCUP Leaders' Forum each award year.

Cyberinfrastructure Health, Assistance, and Improvements (CHAI)

- Number of awards: Up to 10
- Project Length: Up to one year
- Award Size: Up to \$250,000

Preparing for TCUP Implementation (Pre-TI)

- Number of awards: Up to 3
- Project Length: Up to two years
- Award Size: Up to \$150,000

TCUP Partnerships

- Number of awards: Up to 3
- Project Length: Up to five years
- Award Size: Up to \$5,000,000; up to \$825,000 per institution (up to \$165,000 per institution per year; up to \$1,000,000 per project per year)
- Note: Funds should be budgeted for the PI to attend a TCUP Leaders' Forum each award year.

Small Grants for Research (SGR)

- Number of awards: Up to 10
- Project Length: Up to two years
- Award Size: Up to \$200,000

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

IV. Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Organizations eligible to submit TCUP proposals are federally recognized Tribal Colleges and Universities, Alaska Native-serving institutions and Native Hawaiian-serving institutions. Multiple campuses of one university system are normally encouraged to consider collaborative submissions. Executive Order 13021 defines Tribal Colleges and Universities ("tribal colleges") as

those institutions cited in section 532 of the Equity in Educational Land-Grant Status Act of 1994 (7 U.S.C. 301 note), and other institutions that qualify for funding under the Tribally Controlled Community College Assistance Act of 1978, (25 U.S.C. 1801 et seq.), as well as Navajo Community College as authorized in the Navajo Community College Assistance Act of 1978, Public Law 95-471, Title II (25 U.S.C. 640a note). The term "Alaska Native-serving institution" means an institution of higher education that is an eligible institution under section 1058(b) of the Higher Education Act; and that, at the time of submission, has an undergraduate enrollment that is at least 20 percent Alaska Native students. The term "Native Hawaiian-serving institution" means an institution of higher education that is an eligible institution under section 1058(b) of the Higher Education Act; has a Carnegie classification of baccalaureate or associates college; and has, at the time of submission, an undergraduate enrollment that is at least 10 percent Native Hawaiian students. By signing and submitting the proposal, the proposer is certifying that they meet the eligibility criteria specified in this program solicitation. Willful provision of false information in this request and its supporting documents or in reports required under an ensuing award is a criminal offense (U.S. Code, Title 18, Section 1001). Eligibility may be verified by consulting the Integrated Postsecondary Education Data System (IPEDS) or other certified federal government data sources. Other institutions of higher education are eligible to submit collaborative proposals as non-leads with TCUP-eligible institutions under the TCUP Partnerships strands; limitations apply.

Who May Serve as PI:

For the Instructional Capacity Excellence in TCUP Institutions (ICE-TI), TCU Enterprise Advancement (TEA) Centers, and TCUP Partnerships award strands, the principal investigator (PI) is expected to be the president, chief academic officer, another senior academic officer responsible for oversight and management of curriculum and instructional policies for the institution, or a senior STEM faculty member. Typically, the PI for Targeted STEM Infusion Projects (TSIP) or TCUP for Secondary and Elementary Teachers in STEM proposals (TSETS) would be a member of the STEM faculty, but STEM education faculty are encouraged to be part of the key leadership team. The PI for Small Grants for Research (SGR) proposals should be the lead researcher and would typically be a member of the STEM or STEM education faculty. For Cyberinfrastructure Health, Assistance, and Improvements (CHAI), the PI should be a senior STEM faculty member, but the chief information officer (CIO) is strongly encouraged to be part of the key leadership team. Prospective PIs are encouraged to consult TCUP program staff.

Limit on Number of Proposals per Organization:

Eligible institutions may submit only one TEA Center proposal per year but may receive and administer concurrent awards. Preparing for TCUP Implementation (Pre-TI) awards are designed to support TCUP development activities for TCUP-eligible institutions that have received no prior TCUP support, no TCUP support within the previous five years, or are embarking on a significantly novel STEM strategic plan. No other restrictions apply.

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](https://www.research.gov) or [Grants.gov](https://www.grants.gov).

- Full Proposals submitted via [Research.gov](https://www.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.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via Research.gov. PAPPG Chapter II.E.3 provides additional information on collaborative proposals.

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.

Deviations from PAPPG

Under most TCUP strands, the project description section of TCUP proposals is limited to fifteen pages. The project description section of CHAI and Pre-TI proposals is limited to five pages. Unless specifically requested, appendices and letters of collaboration are not allowed in any proposal submitted for TCUP support.

ICE-TI, TSIP, TSETS, TEA Centers, CHAI, Pre-TI, and TCUP Partnerships Require the Following Information that Supplements the PAPPG

Titles for ICE-TI, TSIP, TSETS, TEA Centers, CHAI, Pre-TI, and TCUP Partnerships proposals should specify the strand at the beginning of the title (e.g., "TSIP:"), followed by a clear description of what the project intends to do to enhance cyberinfrastructure at the institution.

Projects supported by ICE-TI, TSIP, TEA Centers, Pre-TI, and TCUP Partnerships awards should implement significant and sustainable enhancements to the institution's STEM instructional capacity or other project-specific element. Consequently, proposals to these TCUP strands must include a description of the project management structure. In addition to the principal investigator, typical project organization consists of a project director and a steering committee with lead faculty from the relevant disciplines or academic programs and administrators from partner institutions, if any. Normally, the principal investigator (PI) is the chief academic officer of the institution, a senior academic officer responsible for oversight and management of curriculum and instructional policies for the institution, or a senior STEM faculty member or administrator.

Proposals submitted to one of these strands are encouraged to include a plan for establishing an external advisory committee, normally convened by the college or university president or another ranking institutional representative not designated as key personnel on the project. The PI cannot chair the advisory committee, nor can other members of the project leadership serve on the advisory committee. This external committee will help guide the implementation and assessment of project activities. There should be adequate representation from partner institutions, industry and the local community, as appropriate, and adequate expertise and experience with the topical and programmatic emphases of the project. Members or prospective members of the committee should be identified in the project description.

TCUP ICE-TI, TSIP, TEA Centers, Pre-TI, and TCUP Partnerships are intended to continue beyond the period of NSF funding. Therefore, successful proposals will provide evidence of the proposing institution's commitment to the improvement of

undergraduate and/or graduate STEM education or other project-specific element, including plans and resource alignment strategies to continue elements of the project after NSF funding ends.

Project Evaluation




The project description of most TCUP proposals (see below for specifics and exceptions) must include an evaluation and assessment plan that will facilitate monitoring of project development and implementation at all stages. Proposals to any strand of the TCUP program, except TEA Centers and SGR, should provide objectives, benchmarks, and indicators of progress that will be used to assess the status of the project. An individual must be explicitly designated in the proposal to lead the evaluation (for proposals in excess of \$500,000, the evaluator should be external to the institution or otherwise administratively separated from the project management or oversight). The evaluation plan must correspond to the overall stated goals and objectives of the project. The specific elements of the evaluation plan will vary depending on the type and details of project. (Note: Proposals from TCUP-eligible institutions that have not previously received TCUP support are allowed to develop and submit an evaluation plan within six months of award notification. The submitted budget for the evaluation should typically total no more than \$50,000.)

A key objective of TCUP is to improve the quality of post-secondary STEM. Accordingly, proposed evaluation and assessment plans should include indicators of progress (as relevant to the specific proposed project) that address the extent to which:

- programs of study, courses, or program components have been developed and implemented; practices specified in the proposal have been incorporated into curricula;
- equipment has been successfully incorporated into curricula (for those projects that acquire equipment); participating or engaged faculty at the awardee institution have been prepared to use educational practices and/or equipment;
- the project is using formative feedback to optimize its activities; and
- project activities have affected student access to quality STEM education as defined by measurable quantitative and/or qualitative outcomes pre- and post-TCUP investment (e.g., accreditation of new programs of study, articulation agreements with relevant institutions of higher education, if applicable, etc.).

Formative and summative evaluations should include comprehensive assessments of student recruitment; curriculum development; and faculty development activities and achievements in addition to evaluation of the direct outcomes of the educational interventions (e.g., student participation and achievement; progression of students to advanced degrees or to the workforce). Yearly reports should include evaluation indicators to date. Reporting of full evaluation activities must be included in the final project report.

For information about evaluation methodology, see:

- The [2010 User-Friendly Handbook for Project Evaluation](#) ;
- the [Online Evaluation Resource Library](#) ;
- the models and checklists available online from the University of Western Michigan's [Evaluation Center](#) ;
- and contact the American Indian Higher Education Consortium ([AIHEC](#) ) about the report *Indigenous Evaluation Framework: Telling Our Story in Our Place and Time* (LaFrance & Nichols, 2010).

The National Science Foundation and the Institute of Education Sciences in the U.S. Department of Education developed Common Guidelines for Education Research and Development. These guidelines describe six types of research studies. For each research type, there is a description of the purpose and the expected empirical and/or theoretical justifications, types of project outcomes, and quality of evidence. The Guidelines ([NSF 13-126](#)) can be found on the NSF website: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13126. For FAQs regarding the Guidelines ([NSF 13-127](#)), see https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13127. Grant proposal writers and PIs are encouraged to familiarize themselves with both documents and use the information therein in the preparation of educational research proposals to NSF.

All successful proposals must articulate a dissemination plan within the Project Description.

Appendices are not accepted. Letters of collaboration are not accepted. Inclusion of letters of collaboration not specifically requested may result in processing delays.

Prospective proposers are encouraged to confer with NSF TCUP staff prior to proposal submission.

SGR Proposals Require the Following Information that Supplements the PAPPG

In addition to following the general format for research proposals as described in the PAPPG, Small Grants for Research (SGR) proposals submitted to TCUP must also adhere to the following special instructions:

Project Summary (one-page limit):

Proposals submitted to the SGR strand should specify the strand in the title (e.g., "SGR: Title"). The SGR project summary should provide an overview, a succinct summary of the intellectual merit of the proposed project, and a description of the broader impacts of the proposed work, including benefits to society, dissemination of work, enhancements to scientific knowledge, as well as how the proposed activity will broaden participation of underrepresented groups for educational research.

Project Description (15-page limit, including tables, figures, and other visual supplements):

The SGR project description should provide a detailed statement of the proposed research to be undertaken. It should contain a:

- brief description of the PI's overall research and education goals;
- detailed description of the proposed research activities including any preliminary data already available and a description of data that the PI plans to obtain;
- description of the relationship between the proposed activities and the PI's projected longer-term research goals;
- discussion of how those activities will benefit the research capacity at the institution; discussion of how students will be involved in this research, if applicable; and
- a plan for dissemination of this research.

Budget:

- Support can be provided for release time during the academic year, summer salary for the PI, travel and housing at the research site for the PI and students, and stipends for student research experiences.
- Cost of equipment cannot exceed 20% of the total budget.

Special Information and Supplementary Documentation:

- affirmation from the PI's Department Chair or Dean stating that the PI will have institutional support in terms of allowance for release time, travel for research purposes, and access to existing research facilities;
- a research plan jointly developed by the PI (and the research collaborator at the research center, university, or national laboratory where the research would be conducted, if applicable); and
- a letter of collaboration from the PI's research collaborator at the research center, university, or national laboratory where the research would be conducted, if applicable.

Additional Funding Opportunities:

Additional funding opportunities for broadening STEM education research topics in student learning, recruitment, retention, persistence to degree, and other STEM educational research for underrepresented minority populations are available throughout the NSF. Please refer to the NSF website for additional information. See especially educational research funding opportunities from other EES programs (e.g., [Louis Stokes Alliances for Minority Participation \[LSAMP\]](#), [Inclusion Across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science \[NSF INCLUDES\]](#)), and those in the NSF's [Division of Undergraduate Education \(DUE\)](#), including the Institutional and Community Transformation track of [IUUE](#).

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Funds should be budgeted for the principal investigator and project director of Instructional Capacity Excellence in TCUP Institutions, Targeted STEM Infusion Projects, TEA Centers, and TCUP Partnerships awards to attend a two-day Leaders' Forum each year.

For SGR projects only: Cost of equipment cannot exceed 20% of the total budget.

For CHAI projects only: Funds are not allowed for key personnel salaries and expenses, although funds for non-key personnel and students are allowed.

C. Due Dates

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

October 15, 2021

Instructional Capacity Excellence in TCUP Institutions (ICE-TI)

October 15, 2021

Targeted STEM Infusion Projects (TSIP)

December 01, 2021

TCUP for Secondary and Elementary Teachers in STEM (TSETS)

January 04, 2022

January 4, Annually Thereafter

Small Grants for Research (SGR)

April 01, 2022

April 1, Annually Thereafter

Targeted STEM Infusion Projects (TSIP)

April 01, 2022

April 1, Annually Thereafter

Instructional Capacity Excellence in TCUP Institutions (ICE-TI) and Targeted STEM Infusion Projects (TSIP)

June 01, 2022

June 1, Annually Thereafter

TCU Enterprise Advancement Centers (TEA Centers)

September 01, 2022

September 1, Annually Thereafter

TCUP for Secondary and Elementary Teachers in STEM (TSETS)

January 11, 2023

January 11, Annually Thereafter

Small Grants for Research (SGR)

September 03, 2024

TCUP for Secondary and Elementary Teachers in STEM (TSETS)

Submission Window Date(s) (due by 5 p.m. submitter's local time):

October 15, 2021 - October 14, 2022

October 15 - October 14, Annually Thereafter

TCUP Partnerships; Cyberinfrastructure Health, Assistance, and Improvements (CHAI); Preparing for TCP Implementation (Pre-TI)

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/ProposalPreparation 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 *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.

B. Review and Selection Process

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

To the greatest practicable extent, proposals submitted to SGR strand will receive at least one review by a reviewer with relevant disciplinary expertise.

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.

Special Award Conditions:

The Foundation and project leaders to whom it makes awards are obliged to conform to the various acts governing activities affecting the environment and cultural or historic properties. Project leaders should be aware of these acts and adhere to their requirements. Project leaders proposing work that may affect cultural or historic properties, or whose work involves tribal lands must cooperate with the agency in complying with the consultation requirements of section 106 of the National Historic Preservation Act. Project leaders are encouraged to contact TCUP for more information about cultural or historic impact considerations of their proposed field work. For additional information on cultural or historic preservation issues, see the Advisory Council on Historic Preservation's web site [here](#).

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.

For each award that includes an evaluation component supported by TCUP, the awardee is asked to submit a copy of evaluation reports. Evaluations supported by TCUP should include progress articulated by proposed goal, objective, or activity. Evaluations supported by TCUP should also include highlights that capture interesting accomplishments or features of the projects. Please note that evaluations are not required for TEA Centers, SGR, CHAI, or Pre-TI awards.

In addition to the requested information listed above, evaluations for ICE-TI and TSIP projects also must include quantitative and qualitative evidence of impact on:

- course, program, and degree offerings;
- enrollment and success rates for students directly or indirectly impacted by TCUP;
- professional development, including degree attainment, of STEM or related TCUP faculty;
- engagement of K-12 students or teachers, if applicable; and
- acquisition of scientific equipment, or IT advances.

Upon request, the program will provide formatting guidance for project leaders on evaluation reports.

TCUP awardees are required to submit copies of any journal articles, etc., that result from work supported by TCUP.

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:

- Jody Chase, Program Director, TCUP, telephone: (703) 292-8640, email: ljchase@nsf.gov
- Jeremy Guinn, Program Director, TCUP, telephone: (703)-292-8193, email: jguinn@nsf.gov
- Regina Sievert, Program Director, TCUP, telephone: (703) 292-2808, email: rsievert@nsf.gov
- Nicole Gass, Program Specialist, telephone: (703) 292-8378, email: ngass@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>.

The National Science Foundation and the Institute of Education Sciences in the U.S. Department of Education developed Common Guidelines for Education Research and Development. The Guidelines describe six types of research studies that can generate evidence about how to increase student learning. Research types include those that generate the most fundamental understandings related to education and learning; examinations of associations between variables; iterative design and testing of strategies or interventions; and assessments of the impact of a fully developed intervention on an education outcome. For each research type, there is a description of the purpose and the expected empirical and/or theoretical justifications, types of project outcomes, and quality of evidence.

The Guidelines publication can be found on the NSF website with the number [NSF 13-126](#). A set of FAQs regarding the Guidelines are available with the number [NSF 13-127](#). Grant proposal writers and PIs are encouraged to familiarize themselves with both documents and use the information therein in the preparation of proposals to NSF.

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:

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