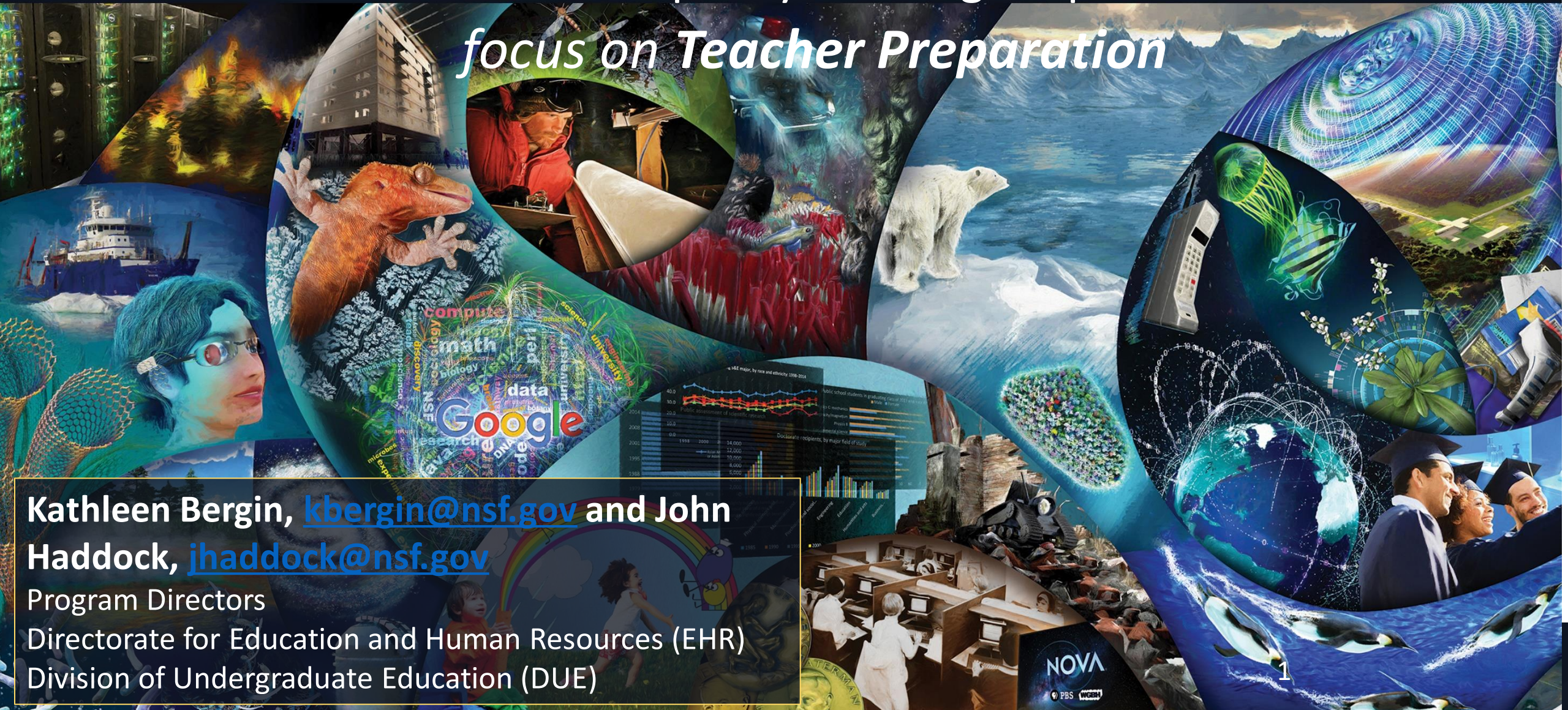




Improving Undergraduate STEM Education (IUSE) Program

Webinar for Level 1 and Capacity Building Proposals due 1.19.22

focus on Teacher Preparation

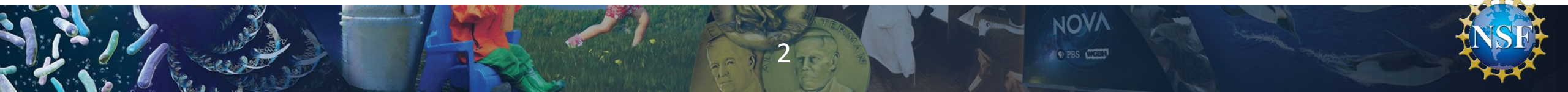


Kathleen Bergin, kbergin@nsf.gov and John Haddock, jhaddock@nsf.gov
Program Directors
Directorate for Education and Human Resources (EHR)
Division of Undergraduate Education (DUE)



This session is being recorded

**In participating in the session,
you are giving permission to record your
question/comment(s).**



Who can apply?

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), Chapter I.E.

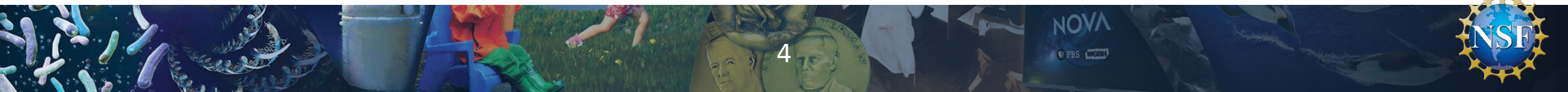
These include, but are not limited to all types of institutions of higher education, professional societies and organizations that work with or represent those institutions.

Unaffiliated individuals are not eligible to submit proposals in response to this solicitation.



Are YOU Interested in...

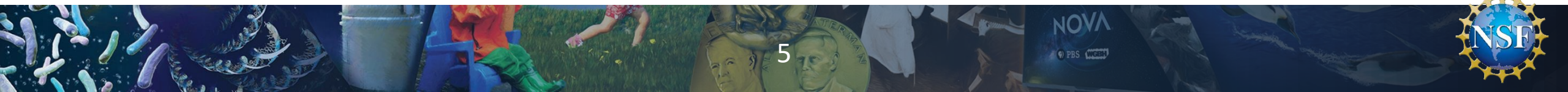
- Making changes at your institution to improve students' STEM learning and engagement?
- Using assessment to enhance what is known about effective STEM teaching and learning practices?
- Considering the implications of the aforementioned factors for pre-service STEM teacher preparation?



Webinar topics (duration about 1.5 hrs. including Q&A):

- What do you want to do?
- Introduction to IUSE: EHR Program
- Description of IUSE: EHR (including tracks & levels)
- Additional Program Details
- Tips for Success
- Resources

*Note: Webinar will include 4 Q & A sessions. Participants should use the **Q&A box** in the platform to ask questions.*



What have you been longing to do to improve STEM Pre-service Education?

Action: Write down 3 things you have been longing to do that require financial resources.

Response: Your *INNOVATIVE* pre-service idea is here!

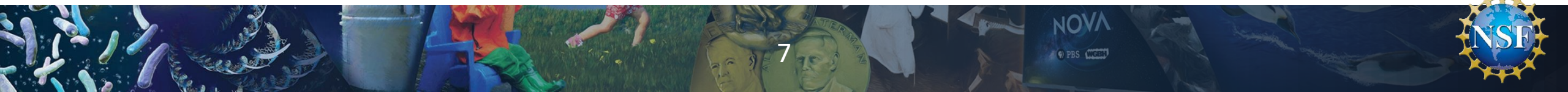
Question: Could NSF fund *your* pre-service idea?

Answer: *YES!*



Improving Undergraduate STEM Education (IUSE) Program Overview

Program Solicitation NSF 21-579

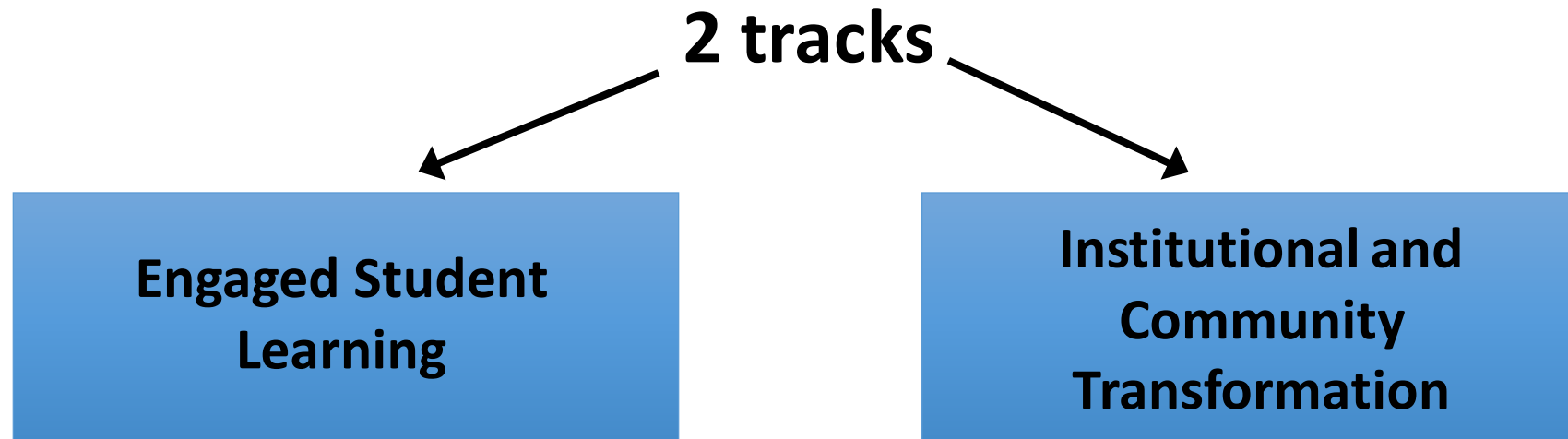


IUSE Seeks to ...

- Improve the quality and effectiveness of the education of undergraduates, including pre-service teachers, in all STEM fields.
- Improve undergraduate STEM teaching and learning for all students and/or the institutional environment where they occur.



Structure of the IUSE program



Development, testing, and use of teaching practices and curricular innovations that will engage students and improve learning, persistence, and retention in STEM

Transformation of colleges and universities to implement and sustain highly effective STEM teaching and learning



IUSE Program Tracks and Levels

Track	Level	Deadlines
Engaged Student Learning	<u>Level 1</u> : up to \$300,000 for up to three years	January 19, 2022 3 rd Wednesday in July and January thereafter
	<u>Level 2</u> : \$300,001 - \$600,000 for up to three years	3 rd Wednesday in July each year
	<u>Level 3</u> : \$600,001 - \$2 million for up to five years	3 rd Wednesday in July each year
Institutional and Community Transformation	<u>Capacity-Building</u> : \$150K (single institution) or \$300K (multiple institutions) for up to two years	January 19, 2022 3 rd Wednesday in July and January thereafter
	<u>Level 1</u> : up to \$300,000 for up to three years	January 19, 2022 3 rd Wednesday in July and January thereafter
	<u>Level 2</u> : \$300,001 - \$2 million - \$2 million (single institution) or \$3 million (multiple institutions and research centers) for up to five years	3 rd Wednesday in July thereafter



Sample ESL Project Themes

- Assessment/metrics of learning and practice (**in STEM or pedagogy courses for teachers**)
- Educational Research (**of best practices in STEM teacher preparation**)
- Conducting undergraduate disciplinary research (**for pre-service teachers**)
- Developing the STEM and STEM-related workforce (**including teachers; not scholarships**)
- Educating a STEM-literate population (**including STEM teachers**)
- Broadening participation in STEM (**including STEM teachers**)
- Exploring co-curricular activities to increase student motivation and persistence (**in STEM teaching**)
- STEM faculty professional development (**including PD for STEM faculty teaching pre-service STEM teachers**)
- Building capacity in higher education (**including STEM teacher preparation programs or curricula**)

Note: While these are some examples of ESL project themes, other themes are appropriate and many other applications to preservice STEM teacher preparation are possible.



Sample ICT Project Themes

- Technology and distance education methods (in STEM or pedagogy courses for teachers)
- Institutional STEM planning efforts and investigation of evidence-based practices in institutional strategic planning and faculty rewards
- STEM faculty professional development (including PD for STEM faculty teaching pre-service STEM teachers)
- Development of instruments and metrics to assess institutional shifts towards evidence-based teaching practices (in STEM or pedagogy courses for teachers)
- Research studies on approaches for advancing change in the STEM undergraduate community (including STEM teacher preparation programs)

Note: While these are some examples of ICT project themes, other themes are appropriate and many other applications to preservice STEM teacher preparation are possible.



Q & A — Session #1



ESL and ICT Track Specifics

Collaborations are encouraged among:

- STEM disciplinary instructors
- Departmental and institutional administrators
- Education researchers

Project Elements: (Section II. Program Description. C.)

- Knowledge base for the project
- Project evaluation plan
- Relevant research questions
- Dissemination plan
- Sustainability



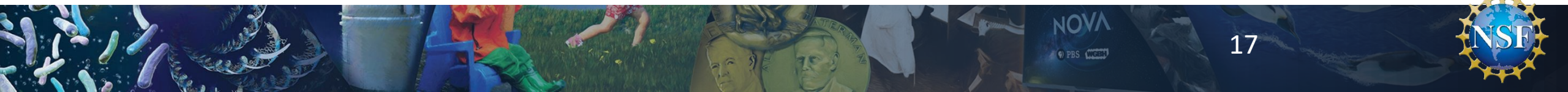
Engaged Student Learning (ESL) Projects

- ❑ Focuses on improving student learning
- ❑ Supports development of improved instructional materials and/or methods
- ❑ Aims to engage students, improve learning, and increase retention in STEM
- ❑ Range of approaches including (but not limited to):
 - Development and implementation of novel instructional methods and technologies
 - Design and assessment of metrics to measure STEM teaching and learning or student outcomes
 - Faculty learning through professional development
 - Discipline-based or interdisciplinary educational research



Institutional & Community Transformation (ICT)

- ❑ Focuses on improving evidence-based instruction by academic departments, institutions, & other organizations/communities
- ❑ Supports efforts to build and understand systemic change in undergraduate STEM education
- ❑ Aims to use appropriate theories of change to transform institutions
- ❑ Range of approaches including (but not limited to):
 - Transformation of high-enrollment, lower-division courses within a discipline or across disciplines to include evidence-based teaching practices
 - Development and propagation of faculty communities of practice to support efforts to improve accessibility or sustainability of evidence-based educational approaches
 - Examination of change processes in colleges, universities, or academic communities and developing metrics and identifying best practices to guide the process of institutional transformation
 - Identification of common elements across disciplines, programs, institutions, or systems that support students from underrepresented groups to be successful in STEM



ICT Proposals

- **Systemic change** at the departmental, institutional, or multi-institutional level, or across communities of STEM educators and/or educational researchers.
- Describe **theory of change**.
- Include **research literature and theoretical perspectives** concerning change.
- Recognize STEM higher education as a **complex system**; achieving goals involves analyzing and addressing organizational factors, such as institutional policies and practices or opportunities for professional growth.



Levels: Scope, Scale & Funding

Scale = number of students, faculty, departments, institutions, or other groups that the work engages

Scope = range of project components involved. Inclusion of investigators and/or institutions new to NSF as project team members or collaborative partners is encouraged as a mechanism for expanding project impact and for building capacity in STEM disciplinary, interdisciplinary, or multi-disciplinary engaged student learning.



Levels: Scope, Scale & Funding (cont.)

ESL

- **Level 1**, up to \$300K & 3 yrs., early stage or exploratory research projects, or adaptation of existing pedagogies and methodologies in novel environments on a small scale.

ICT

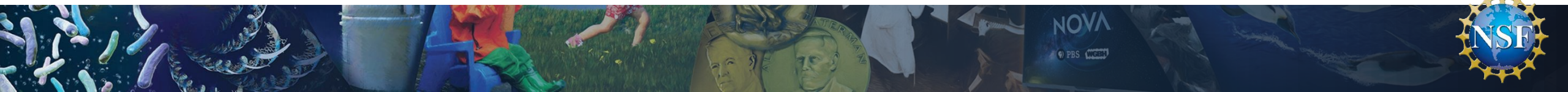
- **Capacity Building**, \$150K single institution, \$300K multi-institution, 2 yrs., early-stage exploratory projects or small to mid-scale projects that build on prior work
- **Level 1**, \$300K, 3 yrs., early stage exploratory or small to mid-scale projects that build on prior work.



ICT Capacity Building

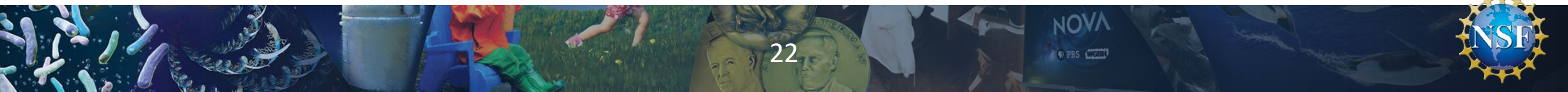
ICT

- enable institutions that have not served as the lead institution on a prior ICT award to identify a project of interest.
- support efforts to
 - assess institutional needs,
 - formulate departmental and/or institutional commitments,
 - develop necessary campus partnerships,
 - audit prior institutional efforts,
 - gather data,
 - learn about relevant theories of change,
 - identify relevant institutional practices and policies,
 - and/or formulate plans for advancing institutional or community transformation.



Key Things to Keep in Mind

- New deadlines
 - 2 submission deadlines per fiscal year (July and January)
 - All tracks and levels accepted for July deadline
 - Only Capacity Building (for ICT) and Level 1 for January deadline
- Expanded description of **conceptual replication**
 - “studies that seek to determine whether similar results are found when certain aspects of a previous study’s method and/or procedures are systematically varied”
- Two alternatives for generating knowledge
 - Research questions
 - Evaluation of project activities, impacts, or outcomes
- Evaluation activities should be aligned with proposed activities and expected outcomes. Evaluation may be conducted by an independent external evaluator, by qualified members of the project team, or guided by a project advisory board.



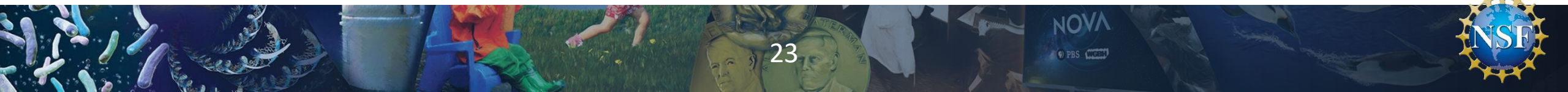
Conceptual Replication or Adaptation Studies

PURPOSE: to broaden or deepen understanding of the efficacy and applicability of evidence-based practices. Thus, such studies should be designed to enable universities and two- and four-year colleges to adopt, adapt, or improve curricular materials, curriculum design, practices, policies, faculty capacity, organizational culture, or climate in ways that improve the learning and learning environments of undergraduate STEM students.

SUPPORT:

- replication of research studies at different types of institutions and with different student bodies, faculty, or institutional types to produce deeper knowledge about the effectiveness and transferability of findings.
- foster propagation of evidence-based STEM teaching and learning approaches in new environments.
- May modify components of an intervention to better meet local needs, implement an intervention in a new environment, improve or adapt assessment instruments, or re-envision the analytic approach to measuring impact.

RESOURCE: The 2018 Companion Guidelines on Replication & Reproducibility in Education Research ([nsf19022 Companion Guidelines on Replication and Reproducibility in Education Research | NSF - National Science Foundation](#))



IUSE Fact Check (*True or False*)

- Q1: All proposals must have a research component.
 - **False, but all proposals must generate new knowledge; this may be through a research component or through a robust evaluation.**
- Q2: Funds for STEM curriculum development, programmatic pathways, learning resources, assessment instruments, and faculty development may receive funding.
 - **True**
- Q3: Proposals may focus on both STEM and non-STEM majors.
 - **True, efforts to improve STEM undergraduate education for either or for both are welcome.**
- Q4: Proposals may focus solely on STEM teacher preparation.
 - **True, as well as any area of STEM undergraduate education.**
- Q4: Proposals should demonstrate a solid grounding in relevant literature on STEM teaching and learning.
 - **True, all proposals should be evidence-based.**
- Q5: Proposals should increase knowledge about effective STEM education through posing one or more research questions or through evaluation of project activities, impacts, or outcomes.
 - **True**
- Q6: Only Universities and Colleges may submit a proposal.
 - **False, all categories of proposers in the PAPPG are eligible**



Q & A — Session #2



IUSE: EHR Research Projects

- Projects that are predominantly research studies may be submitted to either track (ESL or ICT).
- Research studies may explore (among other possibilities):
 - Creation, exploration, or implementation of tools, resources, and models
 - Enhancement of student learning and attitudes through teaching strategies and effective curricula
 - Diffusion of widespread practices through the community
 - Effective professional development



Workshops and Conferences

- Proposals for workshops and conferences addressing critical challenges in undergraduate STEM education may be **submitted at any time**.
- Typically these proposals include **budgets** between \$50,000 and \$100,000.
- Proposers must consult an NSF Program Officer (in the IUSE: EHR program) before submission to determine appropriateness of proposed workshop or conference for IUSE: EHR.



Q & A – Session #3



Tips for Success



Successful IUSE proposals will...

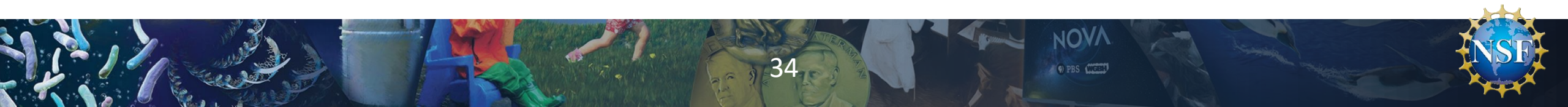
- Build on what is known, summarizing published literature and defining a starting point that extends the prior work
- Include a well-designed plan to gather data
- Specify methods of analysis that will be employed to answer the questions posed
- Include mechanisms to evaluate the success of the project
- Explain how findings and materials will be shared
- Address the sustainability of project efforts
- Collaborate as needed with other investigators, institutions, or communities
- Make the Intellectual Merit and Broader Impacts obvious



Merit Review Considerations

The following elements should be considered in the review for both **Intellectual Merit** and **Broader Impacts**:

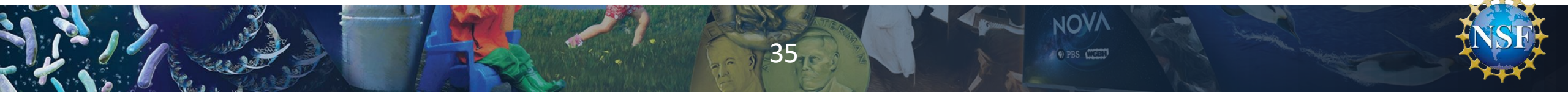
- What is the potential for the proposed activity to:
 - Advance knowledge and understanding within its own field or across different fields (*Intellectual Merit, i.e. what will we learn?*)
- **AND**
- Benefit society or advance desired societal outcomes (*Broader Impacts, i.e. who will be affected?*)
- To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts?



NSF's Merit Review principles

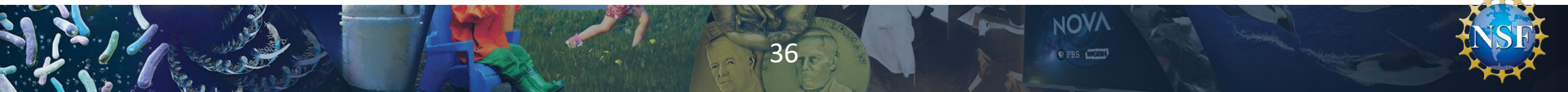
- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects

https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg



Know Proposal Sections

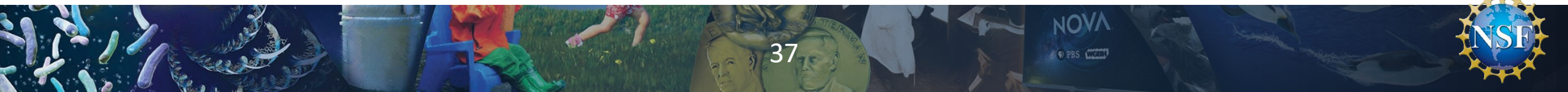
- Cover Page
- Table of Contents
- Project Summary (1-Page)
- Project Description (15-Pages)
- References Cited
- Biographical Sketch(es)
- Budget and Budget Justification
- Current and Pending Support
- Facilities, Equipment and Other Resources
- Special Information and Supplementary Documentation
- Data Management Plan
- Postdoctoral Mentoring Plan (if applicable)
- Single Copy Documents
 - Collaborators & Other Affiliations Information



Documentation of collaboration

Documentation of collaborative efforts are made through letters of collaboration.

- Letters of collaboration should be limited to stating the intent to collaborate and should not contain endorsements or evaluation of the proposed project.
- The *recommended* (but not *required*) format for letters of collaboration is spelled out in the PAPPG 22-1 (II.C.2.j)

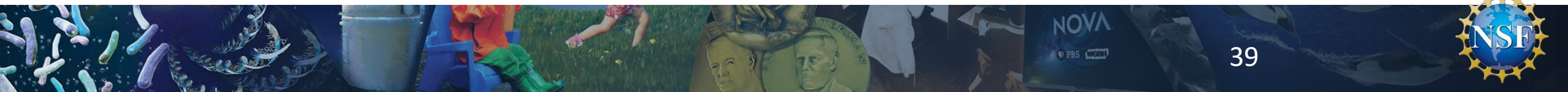


Tips for Success

- Consult the program solicitation and NSF Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 20-1)
- Test drive FastLane or Research.gov or Grants.gov
- Alert the Sponsored Research Office
- Follow page and font size limits
- Be aware of other projects and advances in the field
- Cite the literature
- Provide details
- Discuss prior results
- Include evaluation plan with timelines and benchmarks



Program Resources



Some Helpful Resources

- NSF Proposal and Award Policies & Procedures Guide
 - https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp
- Solicitation, FAQs, and Webinar resources
 - [Improving Undergraduate STEM Education: Education and Human Resources \(IUSE: EHR\) | Beta site for NSF - National Science Foundation](#)
 - [Frequently Asked Questions \(FAQs\) for Improving Undergraduate STEM Education: Education and Human Resources \(IUSE: EHR\) \(nsf21082\) | NSF - National Science Foundation](#)
- NSF Merit Review Overview
 - [Merit Review | NSF - National Science Foundation](#)
- Common Guidelines for Education Research and Development
 - https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13126



Complementary EHR Programs *(with a teacher preparation focus)*

- Robert Noyce Teacher Scholarship Program (Noyce) Track 4: Noyce Research [Robert Noyce Teacher Scholarship Program \(nsf21578\) | NSF - National Science Foundation](#)
- EHR Core Research (ECR) [EHR Core Research \(ECR:Core\) \(nsf21588\) | NSF - National Science Foundation](#)
- Advanced Technological Education (ATE) [Advanced Technological Education \(ATE\) \(nsf21598\) | NSF - National Science Foundation](#)



Thank you for your participation and for your interest in
improving Undergraduate STEM Education,
particularly related to
Pre-Service STEM Teacher Preparation!



REMEMBER...Expectation for knowledge generation

“All IUSE: EHR projects are expected to increase knowledge about effective STEM education. This may be achieved through posing one or more research questions that will be answered through the course of the study or through evaluation of project activities, impacts, or outcomes.” NSF 21-579

