

# Proposal Writing Webinar for NSF's Improving Undergraduate STEM Education: Education and Human Resources (IUSE: EHR) Program (Pre-service Teacher Preparation Focus)



For proposals submitted to *NSF* [19-601](#)

# EHR

DIRECTORATE FOR  
EDUCATION & HUMAN RESOURCES

Program Directors

Kathleen Bergin

[kbergin@nsf.gov](mailto:kbergin@nsf.gov)

Sandra Richardson

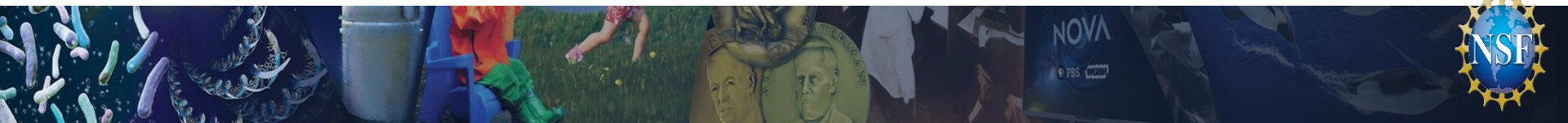
[srichard@nsf.gov](mailto:srichard@nsf.gov)



Div. of Undergraduate Education

This session is being recorded.

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



# Who can apply?

- Proposals are accepted from all types of institutions of higher education and from professional societies and organizations that work with or represent those institutions



## 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?



**Stay tuned to learn more about the IUSE: EHR program ...**



# Webinar Topics

(Webinar Duration: 1.5 hours)

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

*Note: Webinar will include 3 Q & A sessions. Participants should use the Q&A box in the platform to ask questions.*



# Introduction to IUSE: EHR Program



# 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!*



# 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.





# Improving Undergraduate STEM Education (IUSE: EHR)

## Program Goals

**To build knowledge about STEM teaching and learning at the undergraduate level**

Develop novel, creative, and transformative approaches to undergraduate STEM teaching and learning

**To incorporate evidence-based practices in STEM teaching and learning for all undergraduates**

Adapt, improve, replicate, and incorporate evidence-based practices in STEM teaching and learning

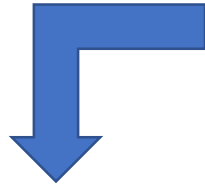
**To build and understand systemic change in undergraduate STEM education**

Lay the groundwork for sustained departmental, institutional, or community transformation and improvement



# IUSE: EHR Program

## Two Program Tracks



### Engaged Student Learning

*Focus on development, testing, and use of teaching practices and curricular innovations that will engage students and improve learning, persistence, and retention in STEM*



### Institutional & Community Transformation

*Focus on transformation of colleges and universities to implement and sustain highly effective STEM teaching and learning*



# 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.*



• QUESTIONS?

• QUESTIONS?

• QUESTIONS?

• QUESTIONS



# ESL and ICT Track Specifics

Collaborations are encouraged among:

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

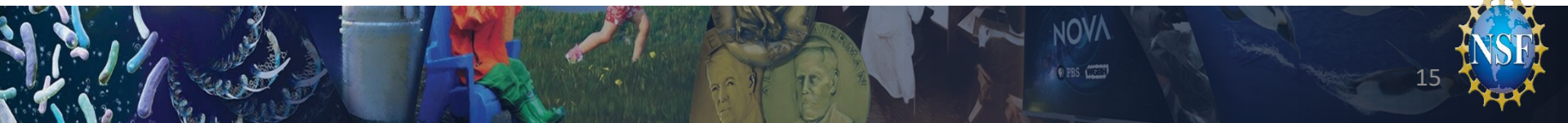
Project Elements: (Section II. Program Description. C.)

- 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)

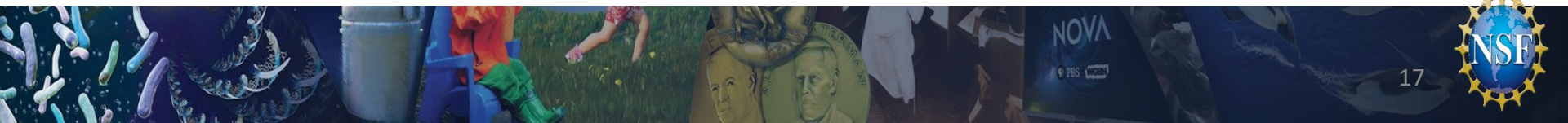
- Focuses on improving evidence-based instruction by academic departments, institutions, & other organizations/communities
- Supports efforts to build and understand systemic change in undergraduate STEM education
- Aims to use appropriate theories of change to transform institutions
- Range of approaches including (but not limited to):
  - Transformation of high-enrollment classes to include evidence-based teaching practices
  - Development of faculty communities to improve accessibility or sustainability of evidence-based practices
  - Identifying best practices to guide 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.



# Program Tracks and Levels

## Tracks and Levels

### Engaged Student Learning

- Increasing engagement and learning through new tools, resources, and models
- Generating knowledge about student learning

### Institutional and Community Transformation

- Spreading and scaling up evidence-based practices using a “theory of change”
- Generating knowledge about the organizational change process

**Level 1: ≤ \$300k, up to 3 yrs**

**Level 2: \$300k - \$600k, up to 3 yrs**

**Level 3: \$600k - \$2M, up to 5 yrs**

**Capacity-Building: \$150k for single institution or \$300k for multiple institutions, up to 2 yrs**

**Level 1: ≤ \$300k, up to 3 yrs**

**Level 2: \$300k - \$2M for single institution or \$3M for multiple institutions, up to 5 yrs**



# 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

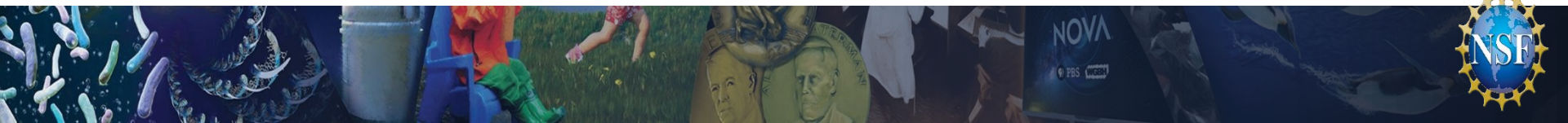
- **Level 1**, up to \$300K & 3 yrs, early stage or exploratory research projects, or adaptation of existing pedagogies and methodologies in novel environments on a small scale.
- **Level 2**, up to \$600K & 3 yrs, design and development efforts or impact studies to improve student learning.
- **Level 3**, up to \$1.2M & 5 yrs, benefit large numbers of students or broad communities of faculty and instructors through large-scale design and development studies or impact research; highly developed research plans with significant research questions or large-scale valuation effort; likely to involve two or more institutions, although single entities considered based on appropriateness of scale and scope.



# Levels: Scope, Scale, & Funding (cont.)

## 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.
- **Level 2**, up to \$2M (1 institution) \$3M (multi-inst.), 5yrs, design and development work or impact research



# Program Deadlines

- Level 1 and Capacity-Building proposals:
  - The first Tuesday in February
  - The first Tuesday in February
- Level 2 and Level 3 proposals:
  - **December 1, 2020** (and the first Tuesday in December thereafter)



# 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**



# IUSE Fact Check (*cont.*)

Which of the following may receive IUSE funding?

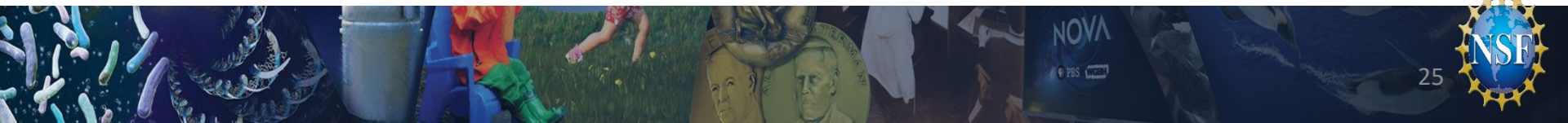
- Demonstrate a strong rationale for project objectives or incorporate and build on educational practices that are demonstrably effective
- Contribute to the development of exemplary undergraduate STEM education
- Add to the body of knowledge about what works in undergraduate STEM education and the conditions that lead to improved STEM teaching and learning
- Measure project progress and achievement of project goals

Answer—ALL of the above



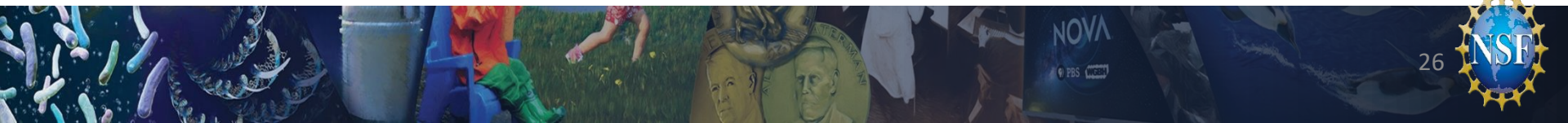


# Q & A — Session #1



# 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 Director (in the IUSE: EHR program) before submission to determine appropriateness of proposed workshop or conference for IUSE: EHR.



# Additional Program Details

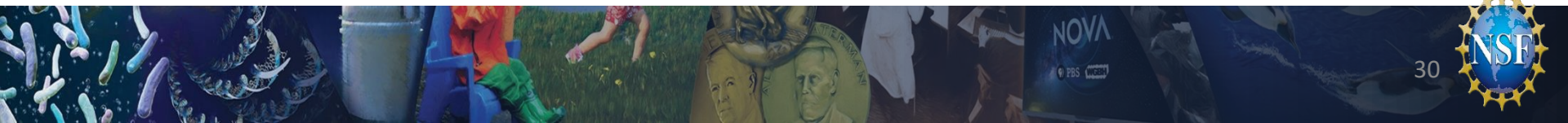


# ESL and ICT Proposals Must...

- Be transportable and propagatable --- and include
  - plans for making project transportable.
  - plans for encouraging, enabling, and facilitating use of findings or developments by others.
- Be evidence-based --- and include
  - evidence-based justification of the proposed topic and approach.
  - substantial discussion from research literature.
- Be knowledge-generating --- and include
  - plans for collecting, analyzing, and sharing data.
  - goals and objectives (intended outcomes).
  - evaluation plan to determine the effect of the intervention.
  - description of how the evaluation results will be a basis for publication.
- Include objective feedback (formative and summative)



# Q & A – Session #2



# 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





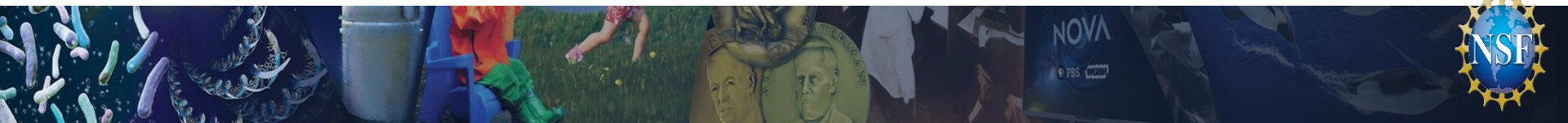
# Know Proposal Sections

- 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



# Tips for Success

- Consult the program solicitation and NSF Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 20-1)
- Test drive FastLane 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](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp)
- Common Guidelines for Education Research and Development
  - [https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf13126](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13126)
- NSF Merit Review Overview
  - [https://www.nsf.gov/bfa/dias/policy/merit\\_review/](https://www.nsf.gov/bfa/dias/policy/merit_review/)
- Solicitation, FAQs, and Webinar resources are available on the IUSE program website
  - [https://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=505082](https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505082)



# Complementary EHR Programs

*(with a teacher preparation focus)*

- Robert Noyce Teacher Scholarship Program (Noyce)  
Track 4: Noyce Research  
<https://www.nsf.gov/pubs/2017/nsf17541/nsf17541.htm>
- EHR Core Research (ECR)  
<https://www.nsf.gov/pubs/2019/nsf19508/nsf19508.htm>
- Advanced Technological Education (ATE)  
<https://www.nsf.gov/pubs/2018/nsf18571/nsf18571.htm>

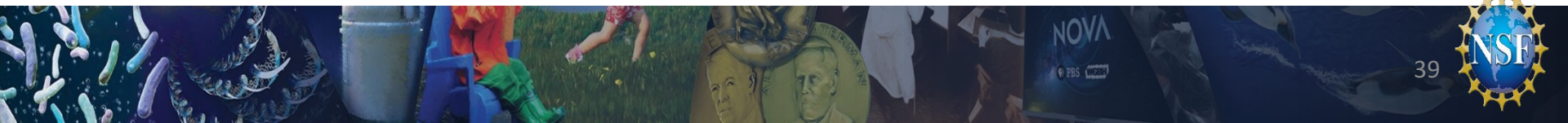


# We Want You!

- Consider serving as a reviewer!
- Contact an IUSE Program Director via email with a copy of your 2-page vita attached.
  - ❖ NSF IUSE Teacher Prep contacts:  
Kathleen Bergin, [kbergin@nsf.gov](mailto:kbergin@nsf.gov)  
Sandra Richardson, [srichard@nsf.gov](mailto:srichard@nsf.gov)



# Q & A – Session #3



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

