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

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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

<table>
<thead>
<tr>
<th>To build knowledge about STEM teaching and learning at the undergraduate level</th>
<th>To incorporate evidence-based practices in STEM teaching and learning for all undergraduates</th>
<th>To build and understand systemic change in undergraduate STEM education</th>
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<td>Develop novel, creative, and transformative approaches to undergraduate STEM teaching and learning</td>
<td>Adapt, improve, replicate, and incorporate evidence-based practices in STEM teaching and learning</td>
<td>Lay the groundwork for sustained departmental, institutional, or community transformation and improvement</td>
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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

<table>
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<tr>
<th>Tracks and Levels</th>
<th>Level 1: ≤ $300k, up to 3 yrs</th>
<th>Level 2: $300k - $600k, up to 3 yrs</th>
<th>Level 3: $600k - $2M, up to 5 yrs</th>
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<tr>
<td><strong>Engaged Student Learning</strong></td>
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<td>• Increasing engagement and learning through new tools, resources, and models</td>
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<tr>
<td>• Generating knowledge about student learning</td>
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<td><strong>Institutional and Community Transformation</strong></td>
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<td>• Spreading and scaling up evidence-based practices using a “theory of change”</td>
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<td>• Generating knowledge about the organizational change process</td>
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<td><strong>Capacity-Building</strong></td>
<td>$150k for single institution or $300k for multiple institutions, up to 2 yrs</td>
<td>$300k - $2M for single institution or $3M for multiple institutions, up to 5 yrs</td>
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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.), 5 yrs, 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
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

• Common Guidelines for Education Research and Development

• NSF Merit Review Overview

• Solicitation, FAQs, and Webinar resources are available on the IUSE program website
Complementary EHR Programs  
(with a teacher preparation focus)

• Robert Noyce Teacher Scholarship Program (Noyce)  
  Track 4: Noyce Research  

• EHR Core Research (ECR)  

• Advanced Technological Education (ATE)  
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
    Sandra Richardson, 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!