Focus on TEACHER PREPARATION

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This Session is being recorded

In participating in the session, you are giving permission to record your question/comment(s).
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 60 min. including Q&A):

• What do you want to do?
• IUSE: EDU Program Overview (including tracks & levels)
• Tips for Success (proposal elements)
• Resources

Note: Participants may use the Q&A box in the platform to ask questions or may wait to unmute and ask a question during one of 3 Q & A sessions.
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!**
What is IUSE: EDU?

• IUSE: EDU is a core STEM education program that seeks to promote novel, creative, and transformative approaches to improve STEM education for all undergraduates.

• The program is open to application from all institutions of higher education and associated organizations.

• NSF places high value on broadening participation by educating students to be leaders and innovators in emerging and rapidly changing STEM fields as well as educating a scientifically literate public.

• IUSE: EDU supports projects that seek to bring recent advances in STEM knowledge into undergraduate education, that adapt, improve, and incorporate evidence-based practices into STEM teaching and learning, and that lay the groundwork for institutional improvement in STEM education.
### IUSE: EDU Program Goals

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<tr>
<th>Goal</th>
<th>Description</th>
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<tr>
<td><strong>To build knowledge about STEM teaching and learning at the undergraduate level</strong></td>
<td>Develop novel, creative, and transformative approaches to undergraduate STEM teaching and learning</td>
<td><strong>To incorporate evidence-based practices in undergraduate STEM teaching and learning</strong></td>
<td>Adapt, improve, replicate, and include evidence-based practices in STEM teaching and learning for all undergraduates</td>
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<td><strong>To build and understand systemic change in undergraduate STEM education</strong></td>
<td>Lay the groundwork for sustained departmental, institutional, or community transformation and improvement</td>
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What does IUSE: EDU expect?

• All IUSE: EDU 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.

• Dissemination of findings is expected. Creative dissemination efforts are encouraged.
**IUSE: EDU Tracks and Levels**

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<tr>
<th>Engaged Student Learning Track</th>
<th>Institutional and Community Transformation Track</th>
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<td>• Increasing engagement and learning through new tools, resources and models</td>
<td>• Spreading and scaling up evidence-based practices using a “theory of change”</td>
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<tr>
<td>• Generating knowledge about student learning</td>
<td>• Generating knowledge about the organizational change process</td>
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| Level 1: | ≤ $400k, up to 3 years |
| Level 2: | $400k - $750k, up to 3 years |
| Level 3: | $750k - $2M, up to 5 years |

| Capacity-Building: | $200k for single institution or $400k for multiple institutions, up to 2 years |
| Level 1: | ≤ $400k, up to 3 years |
| Level 2: | $400k - $2M, up to 5 years |
Sample ESL Project Themes

• Educational Research (of best practices in STEM teacher preparation)
• Assessment/metrics of learning and practice (in STEM or pedagogy courses for teachers)
• Curricula for undergraduate courses (including STEM teacher preparation programs)
• 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)

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

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ESL and ICT Track Specifics

Collaborations are encouraged among:

• STEM disciplinary instructors/faculty/professors
• 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 (continued)

- Identify **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.

• **Funding** = financial request consistent with the scale and scope of the project and the ESL or ICT level indicated
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.

IUSE Fact Check (*True or False*)

- Q1: All proposals must have a research component.
- Q2: Funds for STEM curriculum development, programmatic pathways, learning resources, assessment instruments, and faculty development may receive funding.
- Q3: Proposals may focus on both STEM and non-STEM majors.
- Q4: Proposals may focus solely on STEM teacher preparation.
- Q4: Proposals should demonstrate a solid grounding in relevant literature on STEM teaching and learning.
- 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.
- Q6: Only Universities and Colleges may submit a proposal.
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?

A. Demonstrate a strong rationale for project objectives or incorporate and build on educational practices that are demonstrably effective

B. Contribute to the development of exemplary undergraduate STEM education

C. Add to the body of knowledge about what works in undergraduate STEM education and the conditions that lead to improved STEM teaching and learning

D. Measure project progress and achievement of project goals

Answer—ALL of the above
Basic perspectives for IUSE: EDU projects

• Projects should be both “evidence-based” and “knowledge-generating”
  • Evidence-based: Is the project building on prior work?
  • Knowledge-generating: What will be learned from the planned conduct of the project?

• Perspective: It is okay for IUSE: EDU projects to serve the PI’s institution, but they should also serve all of us by providing useful knowledge for broad constituencies of educators
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
- 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

Proposal components

- 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
  - *List of project personnel*
  - Letters of collaboration
  - Additional biosketches (e.g. for evaluator)
- Data Management Plan
- Postdoctoral Mentoring Plan (if applicable)
- Single Copy Documents
  - Collaborators & Other Affiliations Information
Project summary (1 page)

Each proposal must contain a one-page summary of the proposed project that includes:

• Project overview
• Intellectual merit statement
• Broader impacts statement

NOTE: Label the statement on Intellectual Merit and the statement on Broader Impacts
Project description (15 page limit)

• What you want to do, why you want to do it, how you plan to do it, how you will know if you succeed, and what benefits could accrue if the project is successful

• Project objectives and expected significance

• Relationship of this work to the present state of knowledge in the field, as well as to work in progress by the PI under other support

• Describes the general plan of work in terms of project activities and, where appropriate, provides a clear description and examples of experimental methods, procedures, and interventions

• Must include a section labeled Broader Impacts
Preparing a competitive proposal

• Start with a good idea
• Communicate clearly; check spelling, grammar, and readability
• Address the two merit review criteria: IM and BI
• State research objectives and questions as well as plans for evaluating project success
• Have plans for carrying out the proposed work; give specific examples
• Ground the project in relevant and appropriate literature (perhaps outside of STEM education!)
• Get appropriate expertise on board (co-PIs, senior personnel, advisory board, etc.)
• Ask colleagues (in and out of your field) to read and critique your proposal
Special Information and Supplementary Documentation

• List of project personnel – new requirement!
  • Name, role, and institutional affiliation
  • Project staff, advisory board, evaluator, consultant, collaborators, etc.
  • Do not include graduate or undergraduate students
  • Do not include personnel yet to be named
• Letters of collaboration (NOT letters of support)
• Biosketches for additional personnel (e.g. evaluator, consultants, etc.)
Tips for Success

• Consult the program solicitation and NSF Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 20-1)
• Test drive 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 or Advisory Board intent with timelines and benchmarks
IUSE: EDU Program Resources


IUSE FAQs (23-026) Frequently Asked Questions (FAQs) for the Improving Undergraduate STEM Education: Directorate for STEM Education (IUSE: EDU) Program (nsf23026) | NSF - National Science Foundation

Conduct a search of previously funded awards at https://www.nsf.gov/awardsearch/

Contact a program officer (names and contact info are available on the DUE web page)
Complementary EDU Programs
(with a teacher preparation aspect)

• Robert Noyce Teacher Scholarship Program (Noyce) Track 4: Noyce Research
  Robert Noyce Teacher Scholarship Program (nsf23586) | 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
REMEMBER...Expectation for knowledge generation

“All IUSE: EDU 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 23-510
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 before submission to determine appropriateness of proposed workshop or conference for IUSE: EDU
Q & A – Session #3

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