Proposal Writing Webinar for

NSF's Improving Undergraduate STEM Education: Education and Human Resources (IUSE: EHR) Program

Pre-service Teacher Preparation Focus

NSF 17-590

December 4, 2017

Kathleen Bergin & Sandra Richardson

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NSF Program Directors

Division of Undergraduate Education

IUSE: EHR Program's Two Tracks

Engaged Student Learning

Focus on designing, developing, and implementing research on STEM learning models, approaches, and tools

Two Tiers

- **Exploration & Design** (smaller scale)
  - Up to $300K
  - Up to 3 yrs
- **Development & Implementation** (larger scale)
  - Level I: Up to $600K, Up to 3 yrs
  - Level II: $600K to $2M, Up to 5 yrs

Institutional & Community Transformation

Focus on increasing the propagation of highly effective methods of STEM teaching and learning

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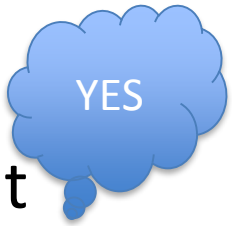
This session is being recorded

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 preservice 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
- Description of E & D Tier
  - Engaged Student Learning and Institution & Community Transformation tracks
  - Research proposals
  - Workshop and conference proposals
- Additional Program Details
  - Important program expectations
  - NSF review criteria
- Resources

Webinar will include two Q & A sessions. Participants will use the Q&A widget at bottom of the screen console to ask questions.

Introduction to IUSE:EHR Program

Pre-Service STEM Teacher Education in IUSE

From Solicitation NSF 17-590:

- "IUSE: EHR encourages projects that develop faculty expertise, **prepare K-12 teachers**, and provide all undergraduate students with STEM competencies and a basic understanding of STEM concepts and principles."

- "… improving K-12 STEM education t**hrough undergraduate pre-service** STEM teacher preparation courses and curricula; encouraging life-long learning; and building capacity in higher education."

IUSE: EHR Program

Two Program Tracks

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What's New?

- **No submission deadline** for E & D proposals in FY2018 and FY2019

- Click here for a link to the current IUSE Solicitation, FAQs (NSF 17-142), and general IUSE Q&A webinars.

IUSE Fact Check

(*True or False*)

- Q1: All proposals must have a research component.
  - True. New knowledge should be generated through an educational research study that poses one or more significant questions and uses a research design to investigate the questions.
- 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 both are welcome.
- Q4: Proposals may focus solely on STEM teacher preparation.
  - True. Proposals may focus on 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 must include an evaluation plan that provides formative and summarize assessment of the effectiveness of the project in achieving its goals.
  - True
- Q6: Only Universities and Colleges may submit a proposal.
  - False. All categories of proposers identified in the NSF PAPPG are eligible.

IUSE Fact Check (*cont.*)

Which of the following may receive IUSE funding?

a. **use and build evidence** about improved STEM instructional practices;
b. **design and study innovative learning opportunities**;
c. **create, implement, and test program, curricular, course, and technology-driven models**;
d. **develop, implement, and test creative approaches for adoption of education research into disciplinary teachings**;
e. **develop and validate assessments/metrics** for undergraduate STEM learning and instructional practice; and
f. **conduct fundamental research** on issues of undergraduate STEM teaching and learning.

Answer — ALL of the above

Description of Tracks in E & D Tier

Engaged Student Learning (ESL) Projects

- Focus on design, development, and research studies.
- Involve the creation, exploration, or implementation of tools, resources, and models that show promise to:
  - increase engagement in STEM learning; and
  - lead to measurable and lasting learning gains.
- Reflect disciplinary differences in needs and priorities.

ESL Track Specifics cont.

- Collaborations are encouraged among:
  - STEM disciplinary researchers
  - Education researchers
  - Cognitive scientists

- Such collaborations should:
  - Leverage what is known about how people learn
  - Contribute to the growth of that body of knowledge

Target Populations for Projects in ESL Track

Target populations include:

- Students at two- and four-year institutions
- STEM majors (declared and undeclared)
- Students whose course of study require solid skills and knowledge of STEM principles
- Non STEM majors seeking to fulfill a general education requirement in STEM
- STEM faculty members
- **Pre-Service STEM teachers in *undergraduate* teacher preparation programs**

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)
- Educating a STEM-literate population
- 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)

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

Institutional & Community Transformation (ICT)

ICT projects may:

- Use **innovative approaches** to increase the **propagation** of highly effective teaching and learning methods, curricular and co-curricular practices across/within disciplinary communities.
- Be **proposed by an institution or set of institutions.**
- Be **proposed by professional communities.**
- Seek to **transform high enrollment, lower division courses.**
- **Implement their efforts in multiple courses** within a department or a college or in a particular disciplinary area.
- Focus on **leadership development** for pedagogical and curricular innovation.

ICT Projects

- Describe **theory of change.**
- Include **research literature and theoretical perspectives** concerning change.
- Recognize STEM higher education as a **complex system.**
- Promote institutional change and include:
  - **Teams** of faculty members
  - **Support** from the department chairs, college deans, or others within the institution's academic leadership
  - **Support** from Provosts or Presidents

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)

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 — Session1

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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):
  - Enhancement of student learning and attitudes through teaching strategies and effective curricula
  - Diffusion of widespread practices through the community
  - Effective professional development
  - Effective institutional change models

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 **budget**s 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.

Additional Program Details

Transportability and Propagation Expectation

Engaged Student Learning and Institutional & Community Transformation proposals must be transportable and propagatable.

- Describe plans for making project transportable.
- Describe plans for encouraging, enabling, and facilitating use of findings or developments by others.
- Provide an evidence-based justification for your approaches.

Knowledge-Based Expectation

Engaged Student Learning and Institutional & Community Transformation proposals must be evidence-based.

- Proposals should provide an evidence-based justification of the importance of the proposed topic and selected approach.
- Justifications should be substantial discussions with references to the literature.

Knowledge-Generating Expectation

Engaged Student Learning and Institutional & Community Transformation proposals must be knowledge-generating.

Proposals should:

- Describe plans for collecting, analyzing, and sharing data.
- Include goals and objectives (intended outcomes).
- Identify an evaluator.
- Include an evaluation plan to determine the effect of the intervention.
- Describe how the evaluation results will be a basis for publication.

Elements of an Assessment and Evaluation Plan

Evaluator

Outcomes

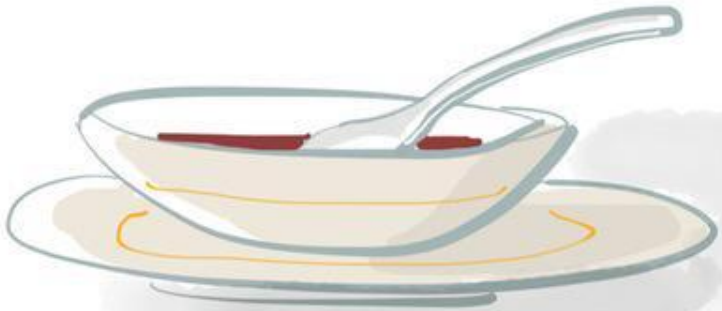
Instruments

Data Analysis

Controls

FORMATIVE SUMMATIVE

WHEN THE **CHEF** TASTES THE SOUP



WHEN THE **GUESTS** TASTE THE SOUP

@bryanMMathers

FROM STEVE WHEELER'S BLOG "THE AFL TRUTH ABOUT ASSESSMENT"

http://steve-wheeler.blogspot.com/2014/10/the-afl-truth-about-assessment.html

Merit Review Considerations

For both ESL and ICT projects, proposals must fully address both IM and BI.

- What is the potential for the proposed activity to:
  - **Advance knowledge and understanding within its own field or across different fields** (Intellectual Merit)?
  - **Benefit society or advance desired societal outcomes** (Broader Impacts)?

- To what extent does the proposed activity suggest and explore **creative, original or potentially transformative concept**s?

Merit Review Considerations (Cont.)

- 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**?
- How well **qualified** is the individual, team, or organization to conduct the proposed activities?
- Are there **adequate resources** available to the PI (either at the home institution or through collaborations) to carry out the proposed activities?

Please Note: Reviewers are also asked to review Facilities, Equipment and Other Resources, Data Management Plan, Postdoctoral Researcher Mentoring Plan, and required Supplementary Documents.

Q&A – Session# 2

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Program Resources

IUSE: EHR Website

- For more information on IUSE: EHR Program visit https://www.nsf.gov/pubs/2017/nsf17590/nsf17590.htm

- Conduct an Awards Search of previously funded IUSE projects at www.nsf.gov.

- Follow up with an NSF IUSE (teacher prep) Program Officer.
  - Kathleen Bergin, kbergin@nsf.gov
  - Sandra Richardson, srichard@nsf.gov

Other Resources

- 2017 NSF Proposal & Award Policies & Procedures Guide (PAPPG)
- 2018 NSF Proposal & Award Policies & Procedures Guide (PAPPG)
  - Effective Date: January 29, 2018
- Common Guidelines for Education R&D

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)
  http://www.nsf.gov/pubs/2015/nsf15509/nsf15509.htm

- Advanced Technological Education (ATE)
  https://www.nsf.gov/pubs/2017/nsf17568/nsf17568.htm

We Want You!

- Consider serving as a reviewer!

- If you are interested in serving as a reviewer on an upcoming IUSE: EHR panel, contact an IUSE Program Officer via email with a copy of your 2-page vita attached.

Thank you for your participation and for your interest in improving undergraduate STEM education,

particularly related to

pre-Service STEM teacher preparation!