



## IMPROVING UNDERGRADUATE STEM EDUCATION

### CONTACTS

Name	Email	Phone	Room
<b>Myles G. Boylan</b>	<b>mboylan@nsf.gov</b>	(703) 292-4617	
<b>Connie K. Della-Piana</b>	<b>cdellapi@nsf.gov</b>	(703) 292-5309	
<b>Katherine J. Denniston</b>	<b>kdennist@nsf.gov</b>	(703) 292-8496	
<b>Don L. Millard</b>	<b>dmillard@nsf.gov</b>	(703) 292-4620	

For specific disciplinary questions proposers are encouraged to contact a Program Officer in their discipline.

#### Biological Sciences

- Kathleen Bergin, Program Director, telephone: (703)292-5171, email: **kbergin@nsf.gov**
- Kate Denniston, Program Director, telephone: (703)292-8496, email: **kdennist@nsf.gov**
- Greg Goins, Program Director, telephone: (703)292-4618, email: **ggoins@nsf.gov**
- Joan Prival, Program Director, telephone: (703)292-4635, email: **jprival@nsf.gov**
- Terry Woodin, Program Director, telephone: (703)292-4657, email: **twoodin@nsf.gov**

#### Chemistry

- Niki Bennett, Program Director, telephone: (703)292-5128, email: **nbennett@nsf.gov**
- Dave Brown, Program Director, telephone: (703)292-8831, email: **drbrown@nsf.gov**
- Hal Richtol, Program Director, telephone: (703)292-4648, email: **hrichtol@nsf.gov**
- Dawn Rickey, Program Director, telephone: (703)292-4674, email: **drickey@nsf.gov**

#### Computer Science

- Valerie Barr, Program Director, telephone: (703)292-7855, email: **vbarr@nsf.gov**
- Jane Prey, Program Director, telephone: (703)292-4629, email: **jprey@nsf.gov**
- Paul Tymann, Program Director, telephone: (703)292-2260, email: **ptymann@nsf.gov**

#### Engineering

- Amy Chan Hilton, Program Director, telephone: (703)292-4623, email: **achanhil@nsf.gov**
- Susan Finger, Program Director, telephone: (703)292-4639, email: **sfinger@nsf.gov**
- Gul Kremer, Program Director, telephone: (703)292-4640, email: **gkremer@nsf.gov**
- John Krupczak, Program Director, telephone: (703)292-4647, email: **jkrupcza@nsf.gov**
- Don Millard, Program Director, telephone: (703)292-4620, email: **dmillard@nsf.gov**
- Yvette Weatheron, Program Director, telephone: (703)292-5323, email: **yweather@nsf.gov**

#### Geological Sciences

- Amy Chan Hilton, Program Director, telephone: (703)292-4623, email: **achanhil@nsf.gov**

#### Interdisciplinary

- Myles Boylan, Program Director, telephone: (703)292-4617, email: **mboylan@nsf.gov**

- Corby Hovis, Program Director, telephone: (703)292-4625, email: [chovis@nsf.gov](mailto:chovis@nsf.gov)
- Hal Richtol, Program Director, telephone: (703)292-4648, email: [hrichtol@nsf.gov](mailto:hrichtol@nsf.gov)
- Terry Woodin, Program Director, telephone: (703)292-4657, email: [twoodin@nsf.gov](mailto:twoodin@nsf.gov)

## Mathematics

- John Haddock, Program Director, telephone: (703)292-4643, email: [jhaddock@nsf.gov](mailto:jhaddock@nsf.gov)
- Michael Jacobson, Program Director, telephone: (703)292-4641, email: [mjacobso@nsf.gov](mailto:mjacobso@nsf.gov)
- Lee Zia, Program Director, telephone: (703)292-8670, email: [lzia@nsf.gov](mailto:lzia@nsf.gov)

## Physics / Astronomy

- Joyce Evans, Program Director, telephone: (703)292-5098, email: [jevans@nsf.gov](mailto:jevans@nsf.gov)
- Duncan McBride, Program Director, telephone: (703)292-4630, email: [dmcbride@nsf.gov](mailto:dmcbride@nsf.gov)

## Research/Evaluation/Assessment

- Myles Boylan, Program Director, telephone: (703)292-4617, email: [mboylan@nsf.gov](mailto:mboylan@nsf.gov)
- Connie Della-Piana, Program Director, telephone: (703)292-5309, email: [cdellapi@nsf.gov](mailto:cdellapi@nsf.gov)
- Dawn Rickey, Program Director, telephone: (703)292-4674, email: [drickey@nsf.gov](mailto:drickey@nsf.gov)

## Social Sciences and Behavioral Sciences

- Myles Boylan, Program Director, telephone: (703)292-4617, email: [mboylan@nsf.gov](mailto:mboylan@nsf.gov)
- Connie Della-Piana, Program Director, telephone: (703)292-5309, email: [cdellapi@nsf.gov](mailto:cdellapi@nsf.gov)

## PROGRAM GUIDELINES

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Apply to PD 14-7513 as follows:

*For full proposals submitted via FastLane:* standard **Grant Proposal Guidelines** apply.

*For full proposals submitted via Grants.gov:* NSF Grants.gov Application Guide; A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: [http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=grantsgovguide](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide))

## DUE DATES

Full Proposal Target Date: February 4, 2014

## SYNOPSIS

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A well-prepared, innovative science, technology, engineering and mathematics (STEM) workforce is crucial to the Nation's health and economy. Indeed, recent policy actions and reports have drawn attention to the opportunities and challenges inherent in increasing the number of highly qualified STEM graduates, including STEM teachers. Priorities include educating students to be leaders and innovators in emerging and rapidly changing STEM fields as well as educating a scientifically literate populace; both of these priorities depend on the nature and quality of the undergraduate education experience. In addressing these STEM challenges and priorities, the National Science Foundation invests in research-based and research-generating approaches to understanding STEM learning; to designing, testing, and studying curricular change; to wide

dissemination and implementation of best practices; and to broadening participation of individuals and institutions in STEM fields. The goals of these investments include: increasing student retention in STEM, to prepare students well to participate in science for tomorrow, and to improve students' STEM learning outcomes.

Recognizing disciplinary differences and priorities, NSF's investment in research and development in undergraduate STEM education encompasses a range of approaches. These approaches include: experiential learning, assessment/metrics of learning and practice, scholarships, foundational education research, professional development/institutional change, formal and informal learning environments, and undergraduate disciplinary research. Both individually and integrated in a range of combinations, these approaches can lead to outcomes including: developing the STEM and STEM-related workforce, advancing science, broadening participation in STEM, educating a STEM-literate populace, improving K-12 STEM education, encouraging life-long learning, and building capacity in higher education.

The Division of Undergraduate Education (DUE), in collaboration with other NSF directorates, continues to support research and development leading to and propagating interventions that improve both the quality and quantity of STEM graduates. A number of recent publications provide guidance. For example, the President's Council of Advisors on Science and Technology (PCAST) report, *Engage to Excel*, recommends widespread adoption of empirically validated teaching practices that engage students in "active learning," as an important means to enhance retention of STEM majors. Other recommendations include increased use of discovery-based laboratories and course-based research. The National Research Council report, *Discipline-based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering*, provides an analysis of effective practices and a research agenda for continuing to build the knowledge base on how to improve undergraduate STEM education. The *Common Guidelines for Education Research and Development* offer guidance on building the evidence base in STEM learning. Research and development efforts that increase our understanding of effective undergraduate STEM teaching and learning provide the foundation for building the STEM workforce of tomorrow and improving scientific literacy.

Recognizing that the preparation of a globally-competitive workforce, including future teachers, and a scientifically literate populace requires excellent STEM education, DUE supports the improvement of the undergraduate STEM education enterprise through funding research on design, development, and wide-spread implementation of effective STEM learning and teaching knowledge and practice, as well as foundational research on student learning. DUE supports projects that build on both fundamental research in undergraduate STEM education and prior research and development that provide theoretical and empirical justification for the proposed efforts. Proposals should describe projects that build on available evidence and theory, and that will generate evidence and build knowledge.

NSF accepts unsolicited proposals to support projects that address immediate challenges and opportunities facing undergraduate STEM education, as well as those that anticipate new structures and functions of the undergraduate learning and teaching enterprise. In addition, NSF accepts unsolicited proposals for developing Ideas Labs in biology, engineering, and geosciences that will bring together relevant disciplinary and education research expertise to produce research agendas that address discipline-specific workforce development needs.

## **RELATED PUBLICATIONS**

**Frequently Asked Questions (FAQs) for Improving Undergraduate STEM Education (IUSE) (nsf14023)**

## **THIS PROGRAM IS PART OF**

Training

## Events



The National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230, USA Tel: (703) 292-5111, FIRS: (800) 877-8339 | TDD: (800) 281-8749