Some Funding Opportunities in Undergraduate STEM Education at NSF

RON BUCKMIRE
rbuckmir@nsf.gov
Division of Undergraduate Education (DUE)
National Science Foundation

November 5, 2012
University of Central Florida
Outline of Presentation

- Brief Overview of NSF and EHR/DUE
- Review of Selected Programs in DUE
  - TUES (Solicitation 10-544)
  - WIDER (Dear Colleague Letter 12-106)
  - STEP (Solicitation 11-550)
  - S-STEM (Solicitation 12-529)
  - MSP (Solicitation 12-518)
- Important Things To Remember When Submitting
  - IRB Review
  - New NSF proposal requirements
- Suggestions for Proposal Writing
  - Things Reviewers Like
  - Things Reviewers Dislike
- Conclusion
Not Sufficient Funds
NSF in a Nutshell

- Supports basic research & education in Science, Technology, Engineering and Mathematics (STEM)
- FY2013 budget request of $7.4 billion
- Uses grant mechanisms (solicitation, proposals, review, award)
- Peer review with 2 criteria: intellectual merit and broader impacts
- Discipline-based structure
- Cross-disciplinary activities
- Favors innovation
- Independent Executive Branch Agency
- Extensive use of temporary staff ("Rotators")
- National Science Board sets policy
NSF Organizational Chart
NSF Organizational Chart

- National Science Board (NSB)
- Office of Inspector General (OIG)
  - Director for Biological Sciences (BIO)
  - Director for Geosciences (GEO)
  - Director for Computer & Information Science & Engineering (CISE)
    - Directorate for Education & Human Resources (EHR)
  - Director for Engineering (ENG)
  - Office of Budget, Finance, & Award Management (BFA)
  - Office of Diversity and Inclusion (ODI)
  - Office of the General Counsel (OGC)
- Office of Information & Resource Management (OIRM)
- Office of Legislative & Public Affairs (OLPA)
- Director for Mathematical & Physical Sciences (MPS)
- Director for Social, Behavioral, & Economic Sciences (SBE)
- Office of Cyberinfrastructure (OCI)
- Office of Integrative Activities (OIA)
- Office of International Science and Engineering (OISE)
- Office of Polar Programs (OPP)
EHR’s Structure

• DGE—Division of Graduate Education
• DUE—Division of Undergraduate Education
• HRD—Human Resources Development
• DRL—Division of Research on Learning in Formal and Informal Settings
EHR’s Structure

• DGE—Division of Graduate Education
• DUE—Division of Undergraduate Education
• HRD—Human Resources Development
• DRL—Division of Research on Learning in Formal and Informal Settings
Division of Undergraduate Education (EHR/ DUE)

Mission: To promote excellence in STEM education for all students

- DUE is a “mission agency” as well as a supporter of research and development in education
- Many of its programs have the goal of increasing (majors) graduates in STEM fields
- However, the core mission is to achieve this result through improved quality of the teaching and learning environment
Selected Programs in DUE

- TUES
- WIDER
- STEP
- S-STEM
- MSP
TUES
Transforming Undergraduate Education in STEM
(The program formerly known as CCLI)

DUE’s broadest, most innovative program

**Vision**
Excellent STEM education for all undergraduate students.

**Goal**
Stimulate, disseminate, and institutionalize innovative developments in STEM education through the production of knowledge and the improvement of practice.
**TUES: Four Project Types**

**Maximum Award Sizes**

- **Type 1**
  - $200,000 duration: 1 to 3 years
  - (+ $50,000 with community college partner)

- **Type 2**
  - $600,000 duration: 2 to 4 years

- **Type 3**
  - $5,000,000 duration: 3 to 5 yrs (5 if max requested)

- **Central Resource Projects**: 3 - 5 yrs leadership & implementation work to increase impact of TUES
TUES Choice of Type Reflects

- **Scale of the Project**
  - Number of institutions, students and faculty, involved

- **Maturity of the Project (Stage)**
  - Type 1 may lead to Type 2, etc.
  - But prior CCLI or TUES funding is **not required**

- **Scope of the Project**
  - Defined by number of components, based on our view of the cyclic nature of educational innovation
TUES  Type 1 choice often reflects

**Scope, Stage and Scale:**
- One or two program components
- Has not been in existence long (pilot)
- Limited number of students & faculty at one institution or a few institutions

**Expected Results:**
- Contribute to understanding of effective STEM education, typically by exploring new ideas
- Can serve as basis for Type 2 project
TUES: Types of projects

- Integrate new instrumentation or equipment into undergraduate laboratories or field work
- Develop materials that use a new instructional approach embodying current understanding of how students learn
- Introduce content from new research into existing course
- Develop an instrument to assess students’ knowledge
- Explore or pilot internet-based approaches for faculty professional development
- Develop interdisciplinary courses on public issues
- Create curriculum materials and organize summer workshops to promote their adoption by faculty at other institutions

- **TUES Type 2 DUE-1123068 (Schneider): EURO (Enhancing Undergraduate Research Opportunities)**
- **TUES Type 1 DUE-0941980 (Schneider): Learning Environment and Academic Research Network (LEARN): A Model for Retention in the STEM Disciplines**
TUES Cyclic Model for Creating Knowledge and Improving Practices in STEM Education

- Research on Teaching and Learning
- Assess and Evaluate
- New Materials and Strategies
- Increase Faculty Expertise
- Implement Innovations
TUES Five Components from the Cyclic Model

All TUES projects include one or more of these components

- Create learning materials and teaching strategies
- Develop faculty expertise
- Implement educational innovations (not adoption)
- Assess learning and evaluate innovation
- Conduct research on STEM teaching and learning
TUES: Over time, we have increased our emphasis on

- Building on and contributing to the literature on effective STEM education
- Building a community of scholars in STEM education reform
- Identifying project-specific measurable outcomes
  - Project management and evaluation
  - Dissemination
  - Impact on student learning outcomes
TUES  Deadlines

Next Deadline For Type 1
- TBA
  (check NSF website for 2013 deadlines)

Next Deadline For Type 2, Type 3, and Central Resource Projects
- January 14, 2013

NEW SOLICITATION COMING (SOON?)!
Selected Programs in DUE

- TUES
- WI DER
- STEP
- S-STEM
- MSP
WIDER
Widening Implementation and Demonstration of Evidence-Based Reforms

- Brand New Program!(DCL, 07/12, $6m)
- Solicitation being developed at this time
- Focus is on culture change within entire research universities (and wannabes)
- Goal is to promote the widespread adoption of evidence-based teaching
- High Performance Goal in FY 2013 is Undergraduate Education Improvement
Selected Programs in DUE

- TUES
- WIDER
- STEP
- S-STEM
- MSP
STEP

STEM Talent Expansion Program

Goals

• Increase associate’s / bachelor’s degrees in established or emerging STEM fields
• Increase the number of students majoring (U.S. citizens or permanent residents) in STEM
• Improve the pipeline (Community colleges get credit for transfers to 4-year STEM programs)

DUE-1161128 (Young): UCF COMPASS (Convincing Outstanding Math-Potential Admits to Succeed in STEM)
DUE-0525429 (Georgiopoulos): UCF STEP Pathways to STEM: From Promise to Prominence “EXCEL”
STEP

**Maximum Support Levels - Enrollment based**

- $500 K for 5 years for 1-5,000 FTE undergrads
- $1.0 M for 5 years for 5,001-15,000 undergrads
- $2.0 M for 5 years for >15,000 undergrads
  - [20% more if partnering with a community college]

**One proposal per institution**

(can be a partner on only one proposal)

**STEP Budget**

- $22 million expected in FY 2013
- 20-24 awards expected

NSF 11-550, Next Proposal Deadline **December 10, 2012**

**New Graduate 10K+ Track:** $10m Industry-Government partnership between President’s Jobs Council and NSF
Selected Programs in DUE

- TUES
- WIDER
- STEP
- S-STEM
- MSP
S-STEM Scholarships in Science, Technology, Engineering, & Math

- **Goal:** Provides funds to institutions to provide scholarships to academically talented, but **ALSO** financially needy, students
- **Awards:** $600k over 5 years
- **Students can be pursuing:** associate, baccalaureate, or graduate degrees
- **Scholarships can be up to $10,000/yr - up to 4 yrs within the limits of students official level of need.** (They can be less than $10K and less than 4 yrs)
- **Next Proposal Deadline:** Aug 13, 2013
  - DUE-0966249 (Shah): Students Actualizing Talent at Education’s Subsequent Stages (STATESS)
  - DUE-0806931 (Georgiopoulos): Young Entrepreneur and Scholar (YES) Scholarship Program
**S-STEM** Special program features

- PI must be member of STEM faculty
- Scholarships to “natural” cohorts of students
- S-STEM students are full time **AND** US Citizens, Residents, Nationals, or refugees
- Institution must provide some student support structures
- Optional enhancements: research opportunities, tutoring, internships, etc.
- Funds for program from fees on H-1(B) Visas → ~100 awards per year, *every year*
Selected Programs in DUE

- TUES
- WI DER
- STEP
- S-STEM
- MSP
MSP Math and Science Partnership

- MSP awards are competitive, merit-based grants to teams of institutions of higher education, K-12 school systems and supporting partners to investigate novel practices that are likely to improve K-12 student learning outcomes.
- Partnerships are mutually beneficial involving explicit commitments of institutional change to occur at all Core Partners.
- Ideas promoted should be innovative and the Partnership’s research agenda needs to be of national import.
- DUE’s most significant program: ~$700 million in awards since 2002.
MSP Program Details

Next Proposal Deadline: December 18, 2012

Targeted Partnerships
- **Implementation** ($8 million over 5 years)
- **Prototype** ($1.5 million over 3 years)

Four Focal Areas
- Community Enterprise for STEM Learning
- Current Issues Related to STEM Content
- Identifying and Cultivating Exceptional STEM Talent
- K-12 STEM Teacher Preparation

Five Key Required Features
- Partnership Driven
- Challenging Courses and Curriculum
- Teacher Quality, Quantity and Diversity
- Evidence-based Design and Outcomes
- Institutional Change and Sustainability
Some Things To Remember When Writing Proposals

- Institutional Review Board
- Data Management Plan
- Postdoctoral Mentoring Plan
- Ethics Certification
- Helpful Suggestions From Reviewers (Do’s and Do Not’s)
Projects collecting data from or on students or faculty members are considered to involve human subjects & **require** IRB review!!

Proposal should indicate IRB status on cover

- Exempt, Approved, Pending
- Grants will require official statement from IRB declaring the research exempt or approved

See “Human Subjects” section in GPG

*(NSF 13-1: Grant Proposal Guide)*
New Requirements for NSF Proposals

- **Postdoctoral student mentoring plan** in supplemental documents (appendix)
- **Data management plan** needed in supplemental documents – see instructions on the 1st page of solicitation
- **Ethics Certification** that students receiving funds from any NSF award have been educated in the Responsible Conduct of Research (RCR)
Suggestions for Writing NSF Proposals from Reviewers: Strengths

1. Topic is important and timely, introducing new material; or it is responsive to an industry or community need
2. PIs are experienced, strong, and technically sound
3. Proposed collaboration with other organizations (e.g., diverse 4-year schools, community colleges, K-12, etc.) is detailed and believable
4. Proposal has good potential for involving minorities or women
5. Dissemination plan is excellent and will contribute to STEM education knowledge base.
6. Proposed ideas are likely to have a large impact (e.g., Number of students, broadness of idea, etc.)
7. Proposed ideas build on prior work or existing products
8. Evaluation plan is excellent, outstanding, or good
9. Proposed ideas are novel or innovative
10. Proposed activities include non-traditional pedagogy
Suggestions for Writing NSF Proposals from Reviewers: Weaknesses

1. Proposed activities are not described in sufficient detail with clear plans
2. Evaluation plan is missing or incomplete
3. Proposed activities are judged to be not doable or they will not result in expected outcomes
4. Dissemination plan is inadequate and will not contribute to STEM education knowledge base
5. Proposal does not have good potential for involving minorities or women
6. Proposed ideas do not build on prior work or existing products
7. Proposed ideas are not novel or innovative
8. Proposed ideas are not likely to have a large impact (e.g., Number of students, broadness of idea, etc.)
9. Proposed collaboration with other organizations (e.g., diverse 4-year schools, community colleges, K-12, etc.) is not detailed or believable
10. Topic is not important and timely, does not introduce new material, or is not responsive to an industry or community need
Conclusion

Questions?

Comments?

Thanks!

RON BUCKMI RE
rbuckmir@nsf.gov
703-292-5323
Directorate for Education and Human Resources (EHR)
Division of Undergraduate Education (DUE)
National Science Foundation (NSF)