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Resources to Transform Undergraduate Geoscience Education: Activities in Support of Earth, Oceans and Atmospheric Sciences Faculty, & Future Plans

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Abstract

The NSF offers funding programs that support geoscience education spanning atmospheric, oceans, and Earth sciences, as well as environmental science, climate change and sustainability, and research on learning. The ‘Resources to Transform Undergraduate Geoscience Education’ (RTUGeoEd) is an NSF Transforming Undergraduate Education in STEM (TUES) Type 2 special project aimed at supporting college-level geoscience faculty at all types of institutions. The project’s goals are to carry out activities and create digital resources that encourage the geoscience community to submit proposals that impact their courses and classroom infrastructure through innovative changes in instructional practice, and contribute to making transformative changes that impact student learning outcomes and lead to other educational benefits. In the past year information sessions were held during several national and regional professional meetings,

including the GSA Southeastern and South-Central Section meetings. A three-day proposal-writing workshop for faculty planning to apply to the TUES program was held at the University of South Florida - Tampa. During the workshop, faculty learned about the program and key elements of a proposal, including: the need to demonstrate awareness of prior efforts within and outside the geosciences and how the proposed project builds upon this knowledge base; need to fully justify budget and role of members of the project team; project evaluation and what matters in selecting a project evaluator; and effective dissemination practices. Participants also spent time developing their proposal benefitting from advice and feedback from workshop facilitators. Survey data gathered from workshop participants point to a consistent set of challenges in seeking grant support for a desired educational innovation, including poor understanding of the educational literature, of available funding programs, and of learning assessment and project evaluation. Many also noted that their institutions

did not recognize the value of education-related scholarly activities, or undervaluing it compared to more traditional research activities. Given this reality, faculty desire strategies for balancing their time to allow time to pursue both. The current restructuring of NSF educational programs raises questions regarding future directions and the scale of support that may be available from the proposed Catalyzing Advances in Undergraduate STEM Education (CAUSE)* Program. At the time of writing this abstract, specific details have not been communicated, but it appears that CAUSE could encompass components from several programs within the Division of Undergraduate Education’s TUES, STEP, and WIDER programs, as well as the Geoscience Education and OEDG programs in the Geosciences Directorate. The RTUGeoEd project will continue to provide support to faculty seeking CAUSE (and other educational funding within DUE). * Improving Undergraduate STEM Education (IUSE) announcement was released in November with a target date of February 4, 2014.

Is the TUES Program Running this Year?

The Course, Curriculum, and Laboratory Improvement Program (CCL) changed several years ago and renamed Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES). Three types within TUES had specific budget limits that defined the scale and scope of proposed projects. The TUES program is not running this year and has become part of the NSF Division of Undergraduate Education (DUE) IUSE program. IUSE stands for Improving Undergraduate STEM Education and is described in PD 14-7513. The IUSE is a program description, not a solicitation. That means there are virtually no guidelines not found in the generic NSF Grant proposal Guide: http://www.nsf.gov/pubs/policydocs/pappguide/nsf13001/gpg_index.jsp. The IUSE project description is limited to 15 pages, including visual material. Letters documenting collaborations and/or commitment are allowed and included in the supplementary documentation section of the proposal.

What are the Goals of IUSE?

The goal of the IUSE program is to improve STEM education for all students (majors, non-majors, pre-service teachers). It can support curricular innovation in all types of courses including: general education, gateway/introductory level, and advanced courses taken by majors. IUSE supports activities intended to broaden participation in STEM disciplines and retain STEM students to graduation. IUSE supports educational research and assessment of student learning. The structure of IUSE is intended to allow maximum flexibility in addressing program goals and encourage submission of proposals that did not fit under the predecessor programs. However, proposed projects that did fit under the three sunsetted programs -- STEP, TUES, and WIDER -- will be accepted.

How Much Money is Available in IUSE?

There is a large sum available for new projects, equal to the sum of the budgets of the 3 sunsetted programs (~\$90 million). Because there are no budget guidelines it is not possible to predict the number of awards and their distribution among STEM disciplines. The funding rate is expected to be close to 20%.

What are the Budget and Duration of IUSE Projects?

There are absolutely no budget restrictions beyond the NSF Grant Proposal Guide (GPG). While there are no budget limits, the budget should be well justified. Requests for equipment needed for the performance of the project is allowed as long as it is specialized; IUSE does not standard items that an institution should supply its instructional faculty. The duration of IUSE projects is no more than 5 years (an NSF wide restriction), but proposed projects can be 1-3 years.

When is the IUSE Deadline?

As a program description and not a solicitation, there is no deadline for proposal submission. The target date is February 4, 2014. Proposals received on or before the target date will be considered for funding in FY2014. Proposals received after the target date will be held for future consideration.

Is There a Limit to How Many IUSE Proposals I can Submit?

There are no restrictions on the number of proposals PIs or institutions can submit to the IUSE program.

Can IUSE Projects Focus on Student Recruitment?

There is a lack of mention of recruitment (in contrast to retention). However, recruitment work is still possible although it is recommended that you contact a program officer in advance of preparing your proposal to discuss your ideas. Basic things including brochures, high school recruiting visits,

and web sites are not viewed as novel. More substantive activities involving the instructional faculty, such as working with high school faculty and creating opportunities for early college credit, would be more appealing to investigate. Retention remains important because most institutions have good data on the WDF (withdrawal/fail) rate for gatekeeper courses.

Does IUSE Have a Research Focus?

The IUSE description has a greater research focus. However, DUE remains committed to implementation efforts at scale and see this as ripe ground for research. The new NSF/U.S. Department of Education “Common Guidelines for Education R&D” (NSF13-126, August, 2013) would be useful to consider for guiding research projects. There are 6 common guidelines (foundational knowledge; exploratory research; design and development type projects (iterative projects that develop resource, pilot testing, prior to intervention); impact studies; efficacy studies; and scale up studies). IUSE projects do not have to fit under one (or more) of these guidelines, but if it does, be sure to explain this. The collection of meaningful evaluation data also is useful. IUSE definitely is NOT only for education research.

How will IUSE Proposals be Reviewed?

IUSE proposals should address the things listed in the NSF merit review criteria under Intellectual Merit and Broader Impacts. PIs are expected to share significant findings from the proposed work, so including a proactive dissemination plan meets NSF GPG guidelines.

What are IDEAS Labs?

The purpose of an IDEAS Labs is to bring together people with different expertise and provide facilitated brainstorming activities to help them develop a set of innovative, potentially transformative, and bold ideas for new collaborations and proposals. IDEAS Labs in the geosciences offer opportunities for the community to focus on ‘grand challenges and opportunities’. A ‘Dear Colleague’ letter is due out shortly and will include more information.

Proposal Preparation Template

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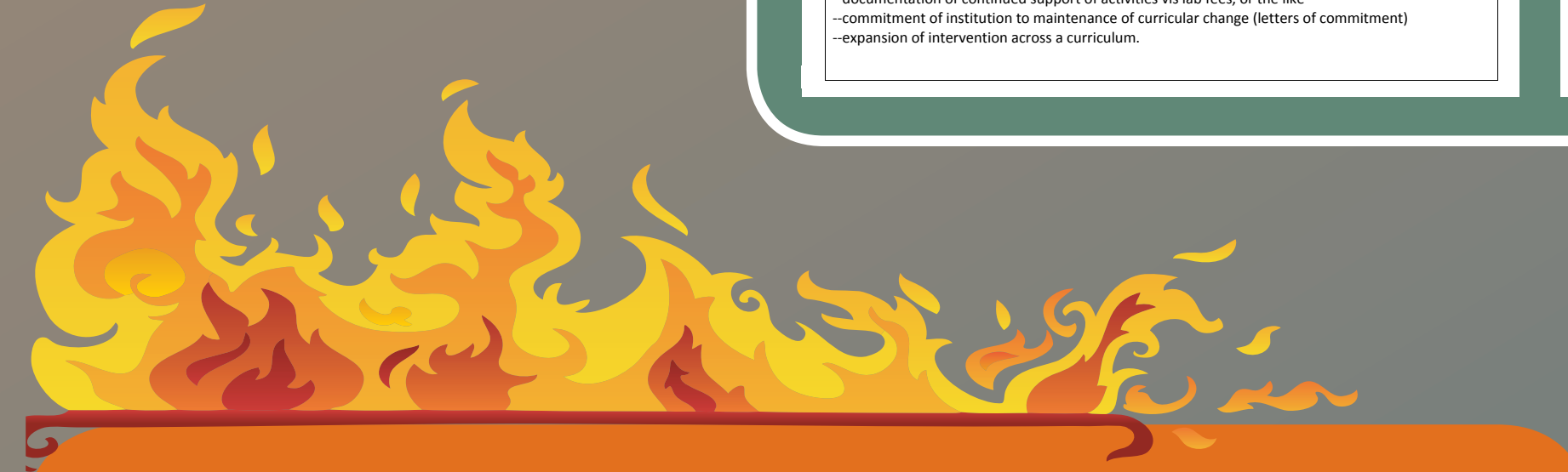
Instructions: Complete each box as thoroughly as possible. Be specific about your plan, how it is proposed, how you will evaluate the project, student learning activities, and dissemination activities. Use the questions in the boxes to guide you. The questions are intended to help you think about the project (transformative evaluation). A completed TUES proposal should include the information requested below:

- Target Audience** (e.g. majors, non-majors, introductory students, advanced students)
 - All about undergraduates, and the “transform” education candidates (include the target audience(s) you want to reach)
 - Educational level of the primary student audience
 - Educational focus of the student audience (e.g. non-major or non-STEM)
 - Secondary audience that will be impacted (e.g. graduate, related science)
- If applicable, describe how the project provides students the opportunity to conduct research (either integrated into a course or as a separate independent research course)
 - How can learning the tools of research while conducting research, or research that follows onto the classroom environment?
- Identify collaborators (e.g. an campus within department and/or an course in another department, or at other institutions). Identify the lead institution (can be a two-year institution) and what each partner will contribute to the project.
 - How do the collaborators include a meaningful partnership between your core two-year institutions and other institutions? How can the budget be increased by \$50,000?
- How do you plan to disseminate the results of the project?
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Template: Key Geoscience Education Proposal Components

- Use the template to organize your ideas and identify what proposal components still need to be completed
- Template boxes are not in the required proposal order, so move the sections as you want to organize your proposal
- Be sure to describe any prior NSF education support, and clearly identify results, including dissemination

Note: Template originally developed to respond to TUES solicitation. Current IUSE announcement is more flexible and does require all elements in the template, so it should be considered as a guide to PIs.



What's 'HOT' in....

GEOSCIENCES

Bringing new research findings into the classroom

Understanding how students learn geoscience concepts (e.g., cognitive, affective)

Visualization software and improving our students' ability to visualize data

Innovative ways to integrate research equipment into undergraduate curricula

Topics of special interest: climate change, sustainability, and energy

Use of cyberlearning tools and platforms (e.g., Google Earth)

Interdisciplinary projects that combine geosciences/geography with other STEM disciplines

For more information go to:
www.buffalostate.edu/rtugeod

Barriers to Proposal Submission:

- Note:** Responses compiled from surveys completed by geoscientists attending a TUES project workshop/session.
- #1 response: Lack of time to develop ideas and write proposals
 - Doesn't “count” as research, only as college service
 - Pressure to submit research proposals
 - High teaching load
 - Member in a small department with limited resources
 - Buy in from faculty since I am staff without formal teaching responsibilities
 - Increased workload if funded
 - Commitment from institution uncertain
 - Little prior experience writing proposals
 - Lack of experience managing project
 - Lack of knowledge about NSF-DUE/education programs
 - Uncertain about IRB requirements
 - New faculty member and not aware of what is available
 - Fear of rejection
 - Intimidation (self-imposed anxiety)
 - Organizing the questions/ideas in my mind
 - Do not have a novel idea (e.g., implement approaches that have been communicated through Cutting Edge)
 - Feeling like my ideas for proposals are just “part of my job” and don’t “deserve” external funding
 - Think it is unlikely that I will get funded given lack of a strong publication record
 - Time it takes to form partnerships to produce a quality work plan
 - Collaboration with others
 - Finding an evaluator
- Of the reasons given, lack of time is the most frequent response. None of the reasons provided are unique to the geoscience community with the exception of the reason referring to implementation of approaches disseminated through ‘Cutting Edge’.