Integrating Broader Impacts into your Research Proposal

Delta Program in Research, Teaching, and Learning

Kristyn S. Masters
Assistant Professor of Biomedical Engineering
Faculty co-director, Delta Program
kmasters@wisc.edu

Recommendation for Change

‘Research directorates should expand resources for educational activities that *integrate education and research*.’

-Shaping the Future, NSF, 1996

Demand for Change

‘Effective October 1, 2002, NSF will return without review proposals that do not separately address both merit review criteria within the Project Summary. We believe that these changes to NSF proposal preparation and processing guidelines will more clearly articulate the importance of broader impacts to NSF funded projects.’

- Important Notice 127

Evolution of NSF's Vision

1995: "Enabling the nation's future through discovery, learning, and innovation."

2006: "Advancing discovery, innovation and education beyond the frontiers of current knowledge, and empowering future generations in science and engineering."

National Science Foundation - Investing in America's Future Strategic Plan - FY 2006-2011

Defining 'Broader Impact'

How well does the proposed activity:

- Advance discovery and understanding while promoting teaching, training, and learning?
- Broaden the participation of underrepresented groups (e.g. gender, ethnicity, disability, etc.)?
- Enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?

What are the benefits of the proposed activity to society in general?

from NSF Review Criteria, 2008

Advancing discovery while promoting teaching and learning

Examples of activities:

- Integrate research activities into STEM teaching at all educational levels
- Participate in the recruitment, training, and/or professional development of K-12 science and math teachers
- Partner with researchers and educators to develop effective means of incorporating research into learning and education
- Establish special mentoring programs for high school students, undergraduates, graduate students, and technicians conducting research
- Develop, adopt, adapt or disseminate effective models and pedagogic approaches to STEM teaching

Broaden participation

Examples of activities:

- Include students from underrepresented groups as participants in the proposed research and education activities
- Establish research and education collaborations with faculty and students at community colleges, colleges for women, undergraduate institutions, and EPSCoR institutions
- Participate in developing new approaches (e.g., use of information technology and connectivity) to engage underserved individuals, groups, and communities in science and engineering
- Participate in conferences, workshops and field activities where diversity is a priority

Enhance infrastructure

Examples of activities:

- Identify and establish collaborations between disciplines and institutions, among the U.S. academic institutions, industry and government and with international partners
- Stimulate and support the development and dissemination of next-generation instrumentation, multi-user facilities, and other shared research and education platforms
- Maintain, operate and modernize shared research and education infrastructure, including facilities and science and technology centers and engineering research centers
- Develop activities that ensure that multi-user facilities are sites of research and mentoring for large numbers of science and engineering students

Broad dissemination

Examples of activities:

- Partner with museums, nature centers, science centers, and similar institutions to develop exhibits in science, math, and engineering
- Involve the public or industry, where possible, in research and education activities
- Give science and engineering presentations to the broader community (e.g., at museums and libraries, on radio shows, and in other such venues.)
- Make data available in a timely manner by means of databases, digital libraries, or other venues such as CD-ROMs
- Publish in diverse media (e.g., non-technical literature, and websites, CD-ROMs, press kits) to reach broad audiences
- Participate in multi- and interdisciplinary conferences, workshops, and research activities

Approach to Research Proposals

- *You* need to have an idea for broader impact of your research
- Propose, and request funding, to support the participation of members of your research team in the Delta Program
  - *Existing programs like Delta will provide you, your graduate students, and/or your post-docs with new abilities that help to realize your idea*
- Courses, programs, and internships will provide you with opportunities to implement your ideas effectively and permanently into the institution

DELTA
Integrating Research, Teaching, and Learning

Approach to Research Proposals

- Stress three outcomes
  - *The creation of an evaluated product*
  - *The implementation of the product for broad impact*
  - *The development of the future workforce/faculty*

- For NSF proposals, note that your proposal leverages off major NSF investments in UW, like Delta and the CIRTL Network
  - *get together with us to talk about your proposal!*

DELTA
Integrating Research, Teaching, and Learning

Capacity for Change

Center for the Integration of Research, Teaching, and Learning (CIRTL)

What is Delta about?

Preparing UW

graduate students and post-docs

for

successful careers

that integrate

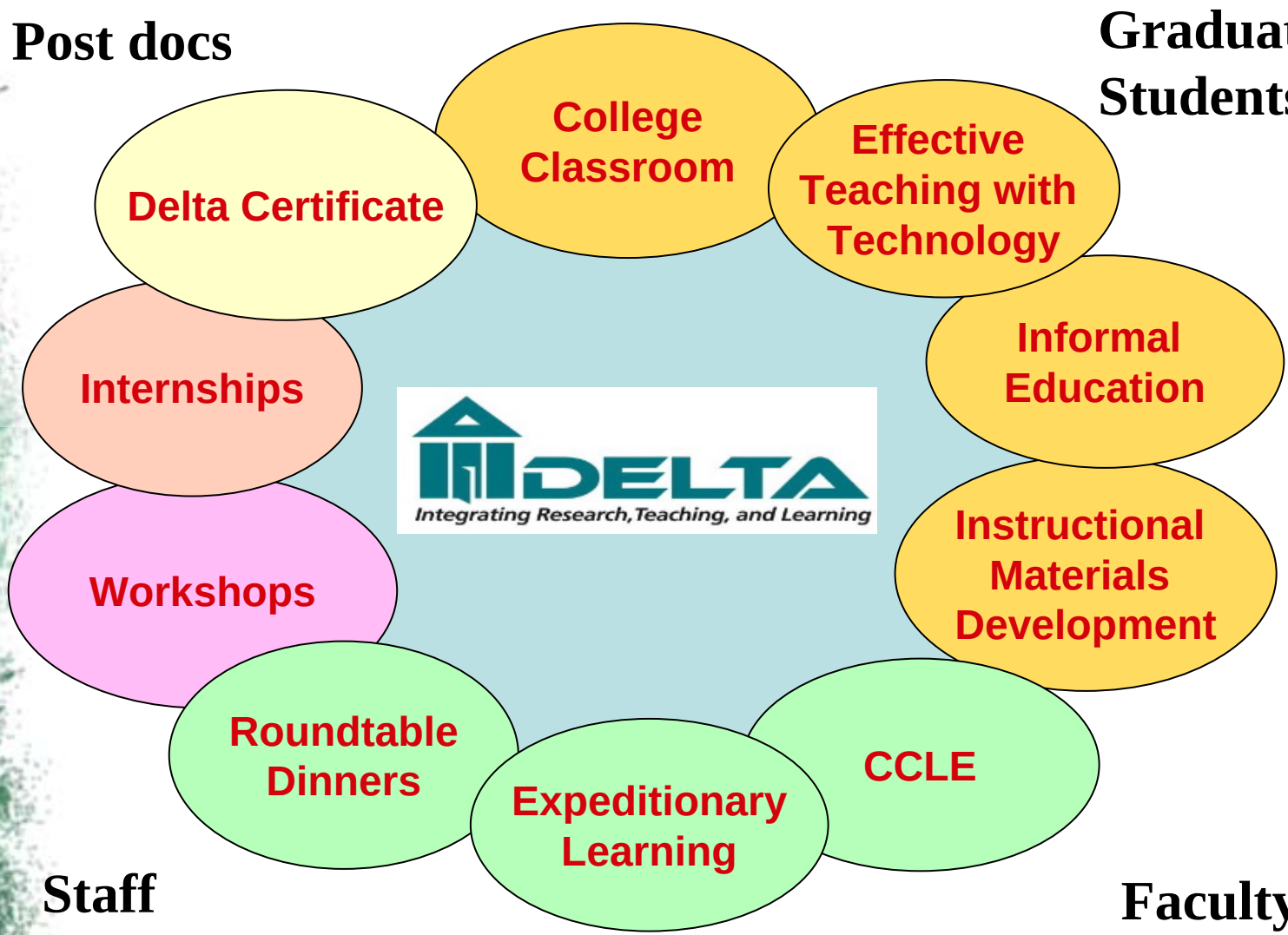
forefront research

and

superb teaching and learning

DELTA
Integrating Research, Teaching, and Learning

Delta Learning Community



Elements of your broader impact plan

- A good broader impact plan will have:

  - *Explicit objectives*
  - *Stated relationship to scientific research*
  - *Understanding of intended audience*
  - *Specific and feasible implementation plans*
  - *Connectivity to existing networks*
  - *Evaluation plan- did you accomplish objectives*

Creating My CAREER Education Plan

- Involved in many teaching enhancement and service activities
  - *random outreach, new courses, Delta involvement…anything I thought sounded like fun*
- Already committed to so many activities that I did not want to add more to my plate
- Decided to find a theme under which I could group all of the things that I was already doing
- Successful CAREER Award is a good way to get internal support for education activities you want to do

How can I group these scattered activities?

- Outreach presentations to high school students
- Two new future BME courses – but I had not actually taught anything yet
  - *Tissue Engineering*
  - *Political, Ethical, Social, and Global Issues in BME*
- Delta involvement
  - *Expeditions in Learning*
  - *CCLE*
- Wisconsin Idea Seminar
- Other Teaching Enhancement Activities:
  - *SEESP, Teaching Academy Summer Institute, Women in Science Opening Workshop*

Education Theme

- "…motivating and enabling scientists and non-scientists alike to engage in lifelong learning through discourses on cutting-edge, yet highly accessible topics (such as tissue engineering), in addition to providing aspiring and current scientists with the tools needed to conduct and disseminate research in ways that lead to optimal promotion of science literacy in the general public."

More details about education plan

- Course design
  - *details about assessment of student learning and assessment of my teaching*
  - *description of special uses of technology in the classroom (i.e. creation of videos to assist in lab activities)*
  - *breakdown of course enrollment*
- Proposed scholarly activities in engineering education
  - *presentation at ASEE*
  - *publication in engineering education journal*
    - proposed specific issues to investigate in my new courses
- Provided lots of education literature citations, including info on NSF and AAAS education priorities

The Budget

- Against recommendations, did not include funding for education activities in budget
  - *should really do this if possible*
  - *originally proposed $500k budget, but most Eng divisions are funding awards at $400k max*
    - best to just propose $400k, because otherwise have to convince program official that you can still do the work with less $ than you requested

- Another recommendation I should have taken: <u>Talk to your Program Officer prior to submission!</u>

Integration with Research Plan

- Proposed education activities involve:
  - *presentation of the PI's own research*
  - *outreach to potential scientists*
  - *training of developing scientists*
  - *educating about the principles which govern scientific research*
    - **all of the above are heavily integrated with research objectives**
- Concept of science literacy is at the heart of all research and innovation
  - *helps form the pool of future scientists, thereby increasing the rate of scientific discovery and advancing the scientific community*
  - *related topics such as ethics, politics, and communication are an integral part of everyday research*

New Insight after Review Panel

- Reviewers and Program Officials really want to see an education component that is *new*
  - *not just activities that you've already established*
  - *something more than just course development – something that is as unique or as innovative as your regular research*