

Integrating Broader Impacts into your Research Proposal

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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.”

2011-current: “NSF envisions a nation that capitalizes on new concepts in science and engineering and provides global leadership in advancing research education”



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



New NSF Strategic Objectives

- Invest in fundamental research to ensure significant continuing advances across science, engineering, and education;
- Integrate education and research to support development of a diverse STEM workforce with cutting-edge capabilities; and,
- Provide world-class research infrastructure to enable major scientific advances

Merit Review Report Recommendations (2013)

- Three guiding review **principles**
 - All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
 - NSF projects, in the aggregate, should contribute more broadly to achieving societal goals.
 - Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects.
- Two review **criteria**
 - Intellectual Merit
 - Broader Impacts
- Five review **elements**

Revised Merit Review Elements

- The following elements should be considered in the review for both criteria:
 - What is the potential for the proposed activity to advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 - benefit society or advance desired societal outcomes (Broader Impacts)?
- To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
- 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 institution 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?

Broader Impact 2.0 – NEW in 2013

- January 2013: NSF released a new version of the Grant Proposal Guide that included significant changes in the review elements for Merit Review (Intellectual Merit and Broader Impacts) based on input from the **National Science Board Task Force on Merit Review**
- Greater “equivalency” of importance of Intellectual Merit and Broader Impacts

Broader Impact 2.0 continued

- “BI may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, yet are complementary to the project.”
- “The quality of the BI activities is more important than the quantity.”
- “Any proposed BI activities includes a mechanism to assess success.”

Tankersley and Bourexis “Broader Impacts 2.0: FAQs about Revisions to NSF’s Broader Impacts Criterion” *Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License*. May 2013

See also Frodeman et al (2013) *Bioscience* 63(3):153-154

Broader Impact 2.0 cont.

- “If you lack experience with conducting activities described in your proposal or if the activities require resources that are not readily available to you or your team, **you should consider collaborating with experts** who can provide the necessary expertise, assistance, and resources.”

Tankersley and Bourexis “Broader Impacts 2.0: FAQs about Revisions to NSF’s Broader Impacts Criterion” *Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License*. May 2013

See also Frodeman et al (2013) *Bioscience* 63(3):153-154

A Framework for Action - 2011

- Workshop held in 2008 by Directorate for Education and Human Resources
 - ▣ Metrics for monitoring broadening participation projects
 - ▣ Designs and indicators to support program evaluation
- I suggest you read the executive summary!

http://www.nsf.gov/od/broadeningparticipation/framework_evaluating_impacts.jsp



What does this mean to you?

You need to have an education/BI plan
that is as compelling as your research plan

This plan will likely constitute 4-5 pages of your proposal

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, 2011

Elements of your integrated 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

What is not sufficient...

- While it is important to describe the significance and impact of your research...
 - ▣ Talking about the impact of your research alone is NOT sufficient to satisfy NSF's broader impact criteria
- Standard course development
- Standard dissemination of research (conferences, publications)
- Standard mentoring of students

Insights from Review Panels

- 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
 - ▣ But, there should also be evidence that you are prepared to follow through on your broader impact activities (i.e., past participation/leadership, use of existing support structures)

Some easy ways to get a start...

Don't get overwhelmed/discouraged by the idea of a broader impacts plan

- Start with an activity that you planned on doing anyway – for instance, offering a new course – and build upon it
- Example - for a course that you are already designing, you can discuss:
 - ▣ details about assessment of student learning and assessment of your teaching
 - ▣ description of special uses of technology in the classroom (i.e., creation of videos)
 - ▣ breakdown of course enrollment (gender, race) and plans for recruitment

Easy ways to get a start (continued)

- For the class that you are already designing/teaching:
 - Propose specific issues to investigate/assess, such as the efficacy of a particular teaching technique
 - Propose scholarly activities in engineering education (to report the outcomes of your investigation/assessment)
 - Presentation at ASEE
 - Publication in engineering education journal
 - Identify other resources that can help you with many of the above plans
 - DoIT (academic technology)
 - WISCIENCE
 - Delta (Interns, Instructional Materials Development course, Effective Teaching w/Technology course, etc.)
- Cite education literature

Another example of how to start...

- If you already plan on doing an outreach activity or demonstration, you can build upon this by:
 - ▣ Using education literature as a foundation for designing your activity
 - ▣ Involving your graduate students and/or undergraduates in the preparation/execution of the activity
 - (this is part of training future faculty!)
 - ▣ Performing an assessment of your activity
 - ▣ Disseminating your methods for planning/performing the activity
 - ▣ Connecting with other resources to improve or enhance your activity (i.e., Delta Informal Education course)
 - ▣ Don't forget to explicitly discuss how this activity is integrated with your research goals

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A few more logistical issues...



- If possible, include funding for education activities in budget
- Talk to your Program Officer prior to submission!

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

- 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!



Advancing discovery while promoting teaching and learning

Examples of activities:

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

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
- 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:

- 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
- Identify and establish collaborations between disciplines and institutions, among U.S. academic institutions, industry and government and with international partners

Broad dissemination



Examples of activities:

- Partner with museums, nature centers, science centers, and similar institutions to develop exhibits in science, math, and engineering
- 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
- Publish in diverse media (e.g., non-technical literature, websites, JoVE, YouTube) to reach broad audiences