




NSF's Broader Impacts Criteria

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Most of the information presented in this workshop represents the presenter's opinion and not an official NSF position



Activity

Reflection


- ▶ What are the three most important pieces of advice for a colleague for dealing with broader impacts in an engineering education-focused proposal (i. e., a TUES proposal)?
- ▶ *Write your ideas on your advice*
 - No discussion
- ▶ Put aside and save



Preliminary Comments


Active & Collaborative Learning

- ▶ Effective learning activities
 - Recall prior knowledge -- actively, explicitly
 - Connect new concepts to existing ones
 - Challenge and alter misconceptions
 - Reflect on new knowledge
- ▶ Active & collaborative processes
 - Think individually
 - Share with partner
 - Report to local and virtual groups
 - Learn from Program Directors' responses




NSF Review Criteria

- ▶ NSF proposals evaluated using two review criteria
 - Intellectual merit
 - Broader impacts
- ▶ Most proposals
 - Intellectual merit done fairly well
 - Broader impacts done poorly



Workshop Goal


- ▶ **GOAL:** To increase the participants' ability to
 - Design projects that respond effectively to NSF's broader impacts criterion
 - Describe a projects' broader impacts in the proposal
- ▶ **OBJECTIVES:** Participants should be able to
 - List categories for broader impacts
 - List activities for each category
 - Evaluate a proposed broader impacts plan
 - Develop an effective broader impacts plan



Preliminary Comments
Workshop Topics


- ▶ Broader impacts categories
- ▶ Reviewing a project's broader impacts
- ▶ Planning broader impacts

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Broader Impacts Categories and Activities

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Activity
Broader Impacts Categories

What does NSF mean by broader impacts?

- ▶ Individually identify an interpretation
- ▶ Report to the group


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NSF Review Criteria

- ▶ Every NSF solicitation has a set of question that provide context for the broader impacts criteria
- ▶ Suggested questions are a *guide* for considering intellectual merit and broader impacts
- ▶ Suggested questions are **NOT**
 - A complete list of "requirements"
 - Applicable to every proposal
 - An official checklist

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NSF Suggested Questions for Broader Impacts

Will the project

- ▶ Advance discovery - promote teaching & learning?
- ▶ Broaden participation of underrepresented groups?
- ▶ Enhance the infrastructure?
- ▶ Include broad dissemination?
- ▶ Benefit society?

NOTE: Broader impacts includes more than broadening participation

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TUES Suggested Questions for Broader Impacts

Will the project

- ▶ Involve a significant effort to facilitate adaptation at other sites?
- ▶ Contribute to the understanding of STEM education?
- ▶ Help build and diversify the STEM education community?
- ▶ Have a broad impact on STEM education in an area of recognized need or opportunity?
- ▶ Have the potential to contribute to a paradigm shift in undergraduate STEM education?

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Activity Dissemination Activities

TASK:

- ▶ Identify activities that “broadly disseminate results to enhance scientific and technological understanding”
- ▶ Pay special attention to activities that will help transport the approach to other sites
- ▶ Individually identify several activities
- ▶ Share these with a neighbor or two
- ▶ Report to the group


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PD's Response: Two Types of Dissemination

- ▶ Dissemination to **general public**
 - Applies to research and education development proposals
 - See handout
- ▶ Dissemination to **peers** (other instructors)
 - Education projects should include strategies for
 - Making other instructors aware of material and methods
 - Enabling other instructors to use material and methods


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General Dissemination – NSF's Representative Activities I

- ▶ Partner with **museums, nature centers, science center**, 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


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General Dissemination -- NSF's Representative Activities II

- ▶ **Publish in diverse media** (e.g., non-technical literature, and websites, CD-ROMs, press kits) to reach broad audiences.
- ▶ Present research and education results in formats useful to **policy-makers, members of Congress, industry**, and broad audiences.
- ▶ Participate in **multi- and interdisciplinary conferences, workshops**, and research activities.
- ▶ Integrate research with education activities in order to **communicate in a broader context**.

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PD's Response Peer Dissemination Strategy

- ▶ **Standard approaches**
 - Post material on website
 - Present papers at conferences
 - Publish journal articles
- ▶ **Consider other approaches**
 - NSDL
 - Specialty websites and list servers (e. g. Connexions)
 - Targeting and involving a specific sub-population
 - Commercialization of products
 - Beta test sites


Focus on active rather than passive approaches

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Reviewing a Project's Broader Impacts


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 **Activity**
Reviewing a Sample Proposal

- ▶ Review the Project Summary & the excerpts from the Project Description
- ▶ Assume the proposal is a TUES Type 1 with a \$200K budget and a 3-years duration and that the technical merit considered meritorious
- **Write broader impacts section of a review**
 - Identify strengths and weaknesses
 - Use a bullet format


▶ Individually identify several strengths and weaknesses
 ▶ Share these with a neighbor or two
 ▶ Report to the group

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 **Program Officers' Views – Review Comments**


- ▶ **Scope of activities**
 - Overall-very inclusive and good
 - Well done but “standard things”
 - Did not address the issue of quality
 - No clear-cut plan
 - Activities not justified by research base
- ▶ **Dissemination**
 - Limited to standard channels
 - Perfunctory

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 **Program Officers' Views – Review Comments (cont)**


- ▶ Industrial advisory committee a strength
- ▶ Collaboration with other higher ed institutions
 - Institutions appear to be quite diverse but use of diversity not explicit
 - Interactions not clearly explained
 - Sends mixed message – raises questions about partnership effectiveness
- ▶ High school outreach
 - Real commitment not evident
 - Passive -- not proactive
 - High school counselors and teachers not involved

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 **Program Officers' Views – Review Comments (cont)**

- ▶ **Modules are versatile**
- ▶ **Broader (societal) benefits**
 - Need for materials not well described
 - Value of the product not explained
 - Not clear who will benefit and how much
- ▶ **Assessment of broader impacts not addressed**

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 **Activity**
Characteristics of Broader Impacts Plans

Identify desirable features of a broader impacts plan or strategy

- General aspects or characteristics


▶ Individually identify several features
 ▶ Share these with a neighbor or two
 ▶ Report to the group

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 **PD's Response**
Characteristics of Broader Impacts Plan


- ▶ **Include strategy to achieve impact**
 - Have a well-defined set of expected outcome
 - Make results meaningful and valuable
 - Make consistent with technical project tasks
 - Have detailed plan for activities
 - Provide rationale to justify activities
 - Include evaluation of impacts
 - Have a well stated relationship to the audience or audiences


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WRAP-UP

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- ## Summary-Broader Impacts
- ▶ Use and build on NSF suggestions
 - List of **categories in solicitations**
 - **Representative activities on website**
 - Not a comprehensive checklist
 - **Expand** on these -- be creative
 - ▶ Develop activities to show
 - ▶ **Integrate and align** with other project activities
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- ## Summary-Broader Impacts (cont)
- ▶ Help reviewers (and NSF program officers)
 - Provide sufficient **detail**
 - Include objectives, strategy, evaluation
 - Make broader impacts **obvious**
 - Easy to find
 - Easy to relate to NSF criterion
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- ## Summary-Broader Impacts (cont)
- ▶ Make broader impacts **credible**
 - Realistic and believable
 - Include appropriate funds in budget
 - **Consistent** with
 - Project's scope and objectives
 - Institution's mission and culture
 - PI's interest and experience
 - ▶ Assure **agreement** between Project Summary and Project Description
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REFERENCES

GPG
http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg

Broader Impacts Activities
<http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf>

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- ## Activity Reflection
- ▶ What are the three most important pieces of advice for a colleague for dealing with broader impacts in an engineering education-focused proposal (i. e., a TUES proposal)?
 - ▶ Write your ideas on your advice
 - **No discussion**
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Activity

Final Reflection

Review your reflective statements

- How have they changed?
- What have you learned?

- ▶ Individually review your statements
- ▶ Share these with a neighbor or two
- ▶ Report to the group

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Questions