NSF’s Broader Impacts Criteria
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Caution
Most of the information presented in this workshop represents the opinions of the individual program offices and not an official NSF position.

Warning on Generalizations
• NSF has several programs supporting undergraduate education
  – Different requirements
  – Different slants
• Proposal improvement ideas apply to all
  – But in varying degrees
• Choose ideas based on
  – Program solicitation
  – Judgment

Overview of Workshops
Goal: Prepare you to write more competitive proposals
Three separate but related workshops
– Proposal strategies
– Broader impacts
– Project evaluation

Framework for the Workshop
• Learning situations involve prior knowledge
  – Some knowledge correct
  – Some knowledge incorrect (i.e., misconceptions)
• Learning is
  – Connecting new knowledge to prior knowledge
  – Correcting misconception
• Learning requires
  – Recalling prior knowledge – actively
  – Altering prior knowledge
Active-Cooperative Learning

• Learning activities must encourage learners to:
  – Recall prior knowledge -- actively, explicitly
  – Connect new concepts to existing ones
  – Challenge and alter misconception
• The think-share-report-learn (TSRL) process addresses these steps

Workshop Format

• “Working” Workshop
  – Short presentations (mini-lectures)
  – Group exercise
• Exercise Format
  – Think → Share → Report → Learn
  – (TSRL)
• Limited Time – May feel rushed
  – Intend to identify issues & suggest ideas
    • Get you started
    • No closure -- No “answers” – No “formulas”

Group Behavior

• Be positive, supportive, and cooperative
  – Limit critical or negative comments
• Be brief and concise
  – No lengthy comments
• Stay focused
  – Stay on the subject
• Take turns as recorder
  – Report for group not your own ideas

Workshop Format

• “Working” format
  – ½ to ¾ of time in team activities
• Limited time to complete activities
  – Frequently feel you need more time
• Purpose: identify, consider & discuss ideas
  – Get you started
  – No “answers”
  – No “formulas”

Workshop Background

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

• To increase the community's ability to design projects that respond effectively to NSF’s broader impacts criterion
Workshop Background

NSF Strategies

- NSF proposals also evaluated relative to two principal strategies
  - Integrating research and education
  - Integrating diversity into NSF programs, projects, and activities
- Both reflected in the broader impacts criterion

Workshop Objective

- At the end of the workshop, 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

Conceptual Framework for the Workshop – Constructivist Model

- Learning situations involve prior knowledge
  - Some knowledge correct
  - Some knowledge incorrect (i.e., misconceptions)
- Learning is
  - Connecting new knowledge to prior knowledge
  - Correcting misconception
- Learning requires
  - Recalling prior knowledge – actively
  - Altering prior knowledge

Constructivist Model and Active-Cooperative Learning

- Learning activities must encourage learners to:
  - Recall prior knowledge -- actively, explicitly
  - Connect new concepts to existing ones
  - Challenge and alter misconceptions
- The think-share-report-learn (TSRL) process addresses these steps

Participation “Rules”

- In small group discussion
  - Be positive, supportive, and cooperative
  - Limit critical or negative comments
  - Be brief and concise in discussions
  - Avoid lengthy comments, stories or arguments
  - Stay focused
  - Get everyone involved
- In reporting to large group
  - Rotate reporters
  - Report group’s views not your own
  - Be brief and concise in discussions

Workshop Approach

Information in “Learn” Phase, represents-

- “official” NSF positions
- NSF suggestions
- Program officers’ opinions
Broader Impacts Categories and Activities

Exercise -- Broader Impacts Categories

**TASK:**
- Identify the categories of activities responding to NSF broader impacts criterion
  - e.g., Increase participation of underrepresented groups

**PROCESS:**
- Think, share, report, learn

Statement of Broader Impacts Merit Review Criteria

- What are the broader impacts of the proposed activity?
  - How well does the activity advance **discovery and understanding** while promoting teaching, training, and learning?
  - How well does the proposed activity broaden the participation of **underrepresented groups** (e.g., gender, ethnicity, disability, geographic, etc.)?
  - To what extent will it enhance the **infrastructure** for research and education, such as facilities, instrumentation, networks, and partnerships?

Statement of Broader Impacts Merit Review Criteria (cont'd)

- Will the results be **disseminated broadly** to enhance scientific and technological understanding?
- What may be the **benefits of the proposed activity to society**?

“Relative Ease Quotient”

What, in your opinion, is the easiest activity to address in a typical proposal? What is the most difficult?

- Discovery and learning
- Broadening participation
- Infrastructure enhancement
- Dissemination
- Societal benefits

Exercise -- Dissemination Activities

**TASK:**
- Identify activities that “broadly disseminate results to enhance scientific and technological understanding”

**PROCESS:**
- Think, share, report, learn
Dissemination -- NSF’s Representative Activities I

- 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.

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.

Converting Activity to Impact I

- Don’t just list activities
  - More is not better
  - Describe the impact of activities
- Develop a strategy (a plan)
- Approach with same detail as intellectual content

Converting Activity to Impact II

- Develop a strategy (a plan)
  - Make coherent and consistent with
    - Institution’s mission and culture
    - PI’s interest and experience
  - Integrate with
    - Project activities
    - Intellectual merit
  - Include metrics and evaluation

Reviewing and Enhancing a Project’s Broader Impacts

Exercise – Review Proposal’s Broader Impacts

TASK:
- Write broader impacts section of a review
- Outline format

PROCESS:
- Think, share, report, learn
Sample Proposal

- Real proposal
  - Project Summary
  - Excerpts from Project Description

- Assume
  - CCLI/Phase 1
  - $150k (total) for 2 years
  - Technical merit considered meritorious

Program Officers' Views – Review Comments I

- 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

Program Officers' Views – Review Comments II

- 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

Program Officers' Views – Review Comments III

- 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

How would you rate this proposal?

- Excellent- 2 hands up
- Very Good- 1 hand up
- Good- 2 hands on head
- Fair- 1 hand on head
- Poor- forearms crossed

Exercise -- Enhancing Broader Impacts Effort

TASK:
Identify additional or enhanced broader impacts activities that will strengthen the project

PROCESS:
- Think, share, report, learn
NSF Program Officer’s Suggestions -- Enhancing Broader Impacts Effort I

• Make activities appropriate to project
  – Establish a mentoring program for high school students
  – Use undergraduate students to interact with high school students
  – Connect to other projects if appropriate

NSF Program Officer’s Suggestions -- Enhancing Broader Impacts Effort II

• Utilize entire PI team in development process
  – Take better advantage of institutional diversity (e.g., assessment of impacts of materials on diversity
  – Improve Dissemination
    – Add faculty workshops
    – Prepare exhibit for local museum

Exercise -- Characteristics of Broader Impacts Plans

TASK:
  – Identify desirable features of a broader impacts plan or strategy
    • General aspects or characteristics

PROCESS:
  – Think, share, report, learn

NSF Program Officer's Suggestions -- Characteristics of Broader Impacts Plan I

• Include strategy to achieve impact
  – Have a well-defined set of outcome objectives
  – Make results meaningful and valuable
  – Make consistent with technical project tasks
  – Have detailed tasks for implementation and evaluation (did it work & why?)
  – Have a well stated relationship to the audience or audiences

NSF Program Officer's Suggestions -- Characteristics of Broader Impacts Plan II

• Don't use “tack on” evaluation and dissemination plans
• Investigate and discuss other broader impacts plans
• Include target group(s) in development
• Be creative!
Exercise -- Reflection on Broader Impacts

**TASK:**
- Identify the most interesting, important, or surprising idea you encountered in the workshop

**PROCESS:**
- Think, share, report, learn

**WRAP-UP**

**Summary-Broader Impacts I**
- 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 impact
- Integrate and align with other project activities

**Summary-Broader Impacts II**
- 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

**Summary-Broader Impacts III**
- 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

**REFERENCES**

Grant Proposal Guide

Broader Impacts Activities
Thanks for your active participation!

Questions?