NSF's Broader Impacts Criteria

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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"

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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**

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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**

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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

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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

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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

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Workshop Approach

Information in "Learn" Phase, represents-

- ✓ "official" NSF positions
- ✓ NSF suggestions
- ✓ program officers' opinions

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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

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Exercise -- Dissemination Activities

TASK:
Identify activities that "broadly disseminate results to enhance scientific and technological understanding"

PROCESS:
– Think, share, report, learn

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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

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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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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

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Exercise – Review Proposal's Broader Impacts

TASK:

- Write broader impacts section of a review
  - Outline format

PROCESS:

– Think, share, report, learn

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Sample Proposal

- **Real proposal**
  - Project Summary
  - Excerpts from Project Description
- **Assume**
  - CCLI/Phase 1
  - $150k (total) for 2 years
  - Technical merit considered meritorious

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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

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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**

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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**

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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

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Exercise -- Enhancing Broader Impacts Effort

TASK:

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

PROCESS:

– Think, share, report, learn

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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

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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

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REFLECTION

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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

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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

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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!

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Exercise -- Reflection on Broader Impacts

TASK:

– Identify the most interesting, important, or surprising idea you encountered in the workshop

PROCESS:

– Think, share, report, learn

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WRAP-UP

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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**

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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**

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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**

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REFERENCES

Grant Proposal Guide
  http://www.nsf.gov/pubs/gpg/nsf04_23/

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

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Thanks for your active participation!

Questions?

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