NSF's Broader Impacts Criterion

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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**

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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

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- **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**
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- **Learning requires**
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  - **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 criterion

- **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 criterion (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**

REFLECTION

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

  http://www.nsf.gov/pubs/gpg/nsf04_23/

Broader Impacts Activities

  http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf

Thanks for your active participation!

Questions?