

Future Directions for Broader Impacts in the NSF Engineering Directorate

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Disclaimer

The views expressed in this presentation are those of the presenter and some of the workshop organizers, and may not reflect those of the National Science Foundation.

Background

NSF (Engineering Directorate) funded a workshop to provide new directions for Broader Impacts.

Time and Location:

26-27 May 2016

National Science Foundation Headquarters
(Ballston)

Arlington, Virginia



The Workshop

Organizers

Sheldon H. Jacobson Jerome F. Hajjar

Dawn Tilbury Andrew Johnson

Scribes

Erick Centeno-Moreno Siqian Shen

Perspective

Characteristics of Workshop Participants

- * Engineering faculty at research institutions
- * Research oriented in their career
- * Had competed successfully for NSF funding
- * Had sat on NSF review panels
- * Were committed to Broader Impacts as a vehicle for “making a difference”

Key point: Faculty Perspective

Background

- Intellectual Merit and Broader Impacts:
 - Grow well-trained, technology literate and skilled workforce domestically.
 - Important to economic and social well-being.
 - Advance the nation's worldwide position in STEM disciplines.
- A **grass-roots effort** is required to organically grow the emphasis on and enhance BI contributions within the NSF target communities.



We are in the Midst of a Revolution!



Federal Deficits, Political Pressures, Societal Skepticism

Approaches for Innovating BI

- Embracing Broader Impacts Evaluation
 - A critical element of NSF proposals.
 - Needs to be done at the panel review level.
 - Communication by Program Directors to their panelists.
 - More than an add-on to Intellectual Merit.

Intellectual Merit and Broader Impacts cannot be viewed as either/or entities, but rather complimentary and synergistic contributions.



Question 1

What is Broader Impact?

What is Broader Impact?

- NSF GPG (2017-1)
 - Broader impacts may be **accomplished through the research itself.**
 - societal benefits of the proposed research.
- In layman's terms:
 - **How will the world be better as a result of or a byproduct of the Intellectual Merits?**
- Broader Impacts is the natural next step from the Intellectual Merits research outputs.



What is Broader Impact?

The workshop participants understood Broader Impacts from different perspectives.

Extrapolating the difference to the research community implies that the community as a whole has only a **vague understanding of the BI criteria**.

One of the main workshop outcomes was to identify a clear classification of the diverse set of goals/outcomes encompassing the BI criteria



Question 2

How can Broader Impacts be classified?

How can Broader Impacts be classified?

- Given the confusion on the definition/meaning of BI, it is useful for NSF to:
 - Provide a framework for thinking about BI.
 - Avoid a list of prescriptive activities.
- Benefits of such a framework:
 - Assist PIs to more clearly define and identify BIs of their research projects.
 - Make the evaluation process more transparent.



How can Broader Impacts be classified?

Suggest a BI classification along three dimensions:

- **Immediacy** of the IM and BI.
- Type of **Societal Benefit**.
- Outcome **Time Horizon**.

Immediacy of the IM and BI classification:

- Intrinsic (High Immediacy).
- Direct (Moderate Immediacy).
- Extrinsic/Far Reaching (Low Immediacy).



How can Broader Impacts be classified?

According to the type of **societal benefits** they bring, Broader Impacts can be classified as:

- Information/Communication.
- Global Leadership.
- People / Human Capital.
- Economic.
- Health.
- National Interests.

This classification is neither prescriptive, exhaustive, nor rigid. Broader Impacts may fit into several classes or in none.



Question 3

What is the time frame for Broader Impact?

What is the time frame for Broader Impact?

- As per the **Outcome-Time Horizon**, Broader Impacts can be classified: Short, Medium, and Long term
- Limited Broader Impacts **dissemination mechanisms** are available: Journals / conferences dedicated to archive BI contributions.
- Workshop participants agreed that funded projects have significant BI but are less known to the research community and general public.
 - Crisis in **Communication**.



Question 4

What is an appropriate balance between
Intellectual Merit and Broader Impact?

Is there a tradeoff or should they be
inextricably linked?

What is an appropriate balance between IM and BI?

Intellectual Merit and Broader Impacts cannot be viewed as either/or, but rather, **complimentary and synergistic contributions.**

Portfolio Approach:

- The goal of each program is to build a strong and balanced funded-projects portfolio.
- The portfolio could comprise proposals that have either very strong Intellectual Merit and/or very strong Broader Impacts (ideally both!)



What is an appropriate balance between IM and BI?

A Possible Approach to Enhance BI Contributions:

1. Evaluate and select proposals based on strong Intellectual Merit, and Intrinsic and Direct BIs.
2. PIs of funded proposals can propose Extrinsic/Far Reaching BI and request an additional funding supplement.

Potential Benefits:

- Allow PIs to have more information, time, and resources to pursue **more difficult and substantial BI tasks** (innovating education, outreach to general public.)
- As these activities are funded, it will be **easier to track BI results** and to hold PIs accountable.



Key Observations

Broader Impact is often misunderstood by researchers.

Tension between Intellectual Merit and Broader Impacts often leads to Broader Impacts taking a back seat to Intellectual Merit in proposals and research effort.

NSF (Eng) has facilitated this by how proposals have been evaluated.

For researchers to take Broader Impacts seriously, NSF (Eng) must take Broader Impacts seriously during the review/funding decision process.



Post Workshop Insights

For PIs to take Broader Impacts seriously, it must provide academic value (WIIFM).

Archival journals that publish Broader Impacts are needed.

Post Workshop Insights

The two criteria model is flawed.

When presented with two objectives, human nature inherently prioritizes them, based on internal biases or external values.

A single criterion is needed that embodies both Intellectual Merit and Broader Impacts.

One possibility: *Advancing Knowledge for Society*

The Secret

Why is Broader Impact worth a faculty member's time?

Pass it Forward

Message to Share



This is not your parents' education system

***The best time to plant
a tree was 20 years
ago. The second best
time is now.***

-- CHINESE PROVERB

**Begin to advance, track and
broadly disseminate innovations
in Broader Impacts activities that
impact our society, such that
NSF's investments reap rewards
for decades to come.**

