

EVALUATION STRATEGIES FOR MEASURING THE BROADER IMPACTS (BI) IN NSF INCLUDES PROJECTS

Multi-Scale Evaluation in STEM Education



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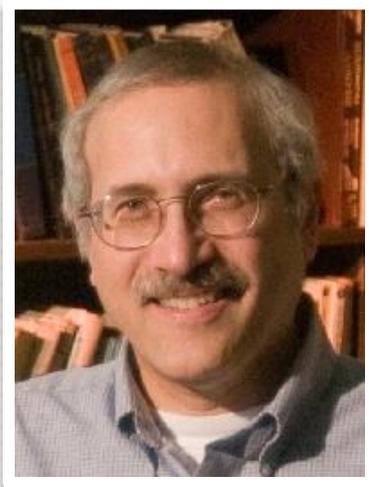
NIMBioS
National Institute for Mathematical
and Biological Synthesis



NISER
NATIONAL INSTITUTE FOR STEM
EVALUATION AND RESEARCH

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MEET YOUR MODERATOR



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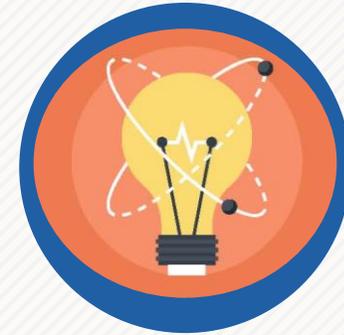
WHO IS THIS PRESENTATION FOR?



**PRINCIPAL
INVESTIGATORS**
OF NSF INCLUDES PROJECTS



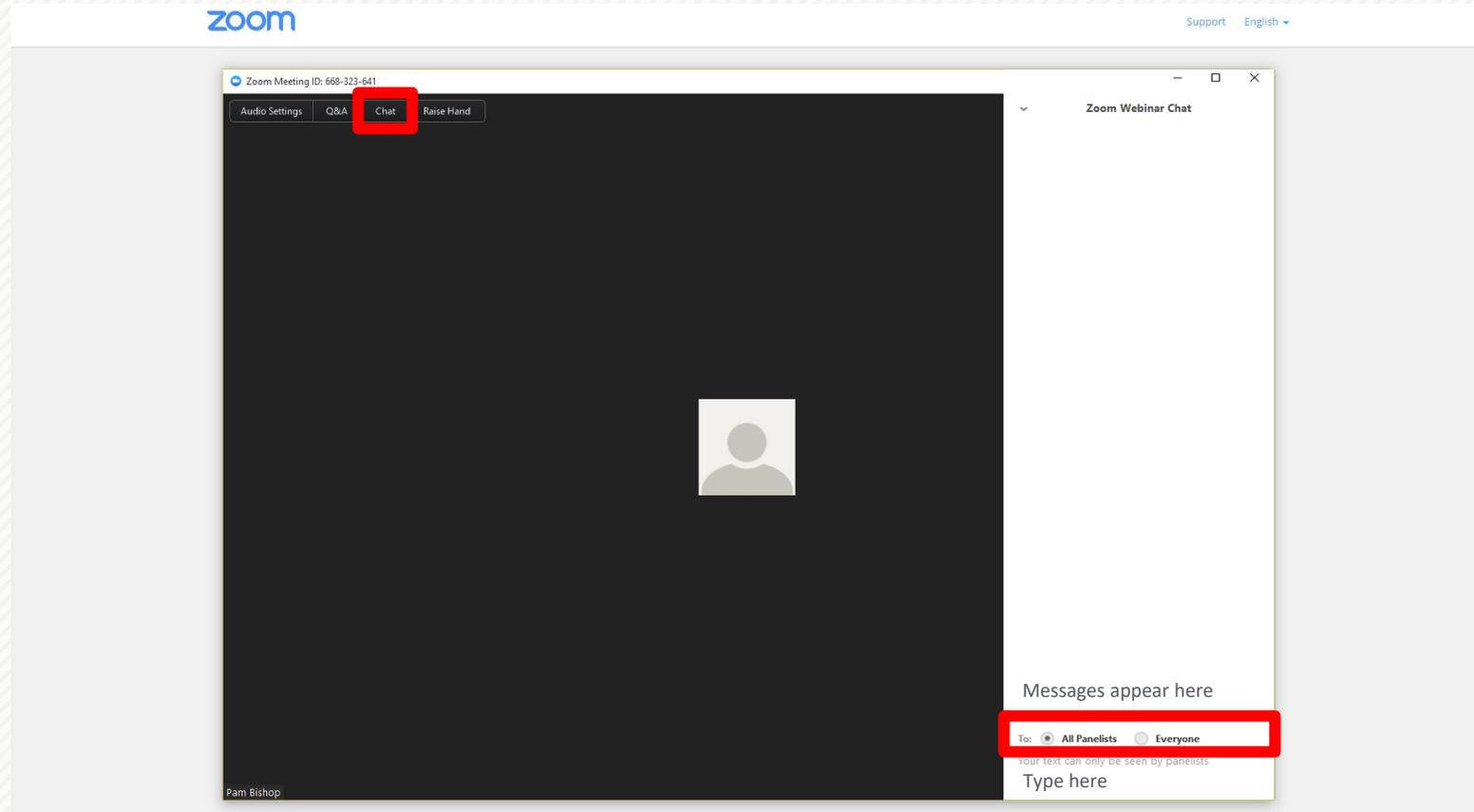
STEM EDUCATORS
PLANNING TO SUBMIT
BROADENING PARTICIPATION
PROPOSALS



STEM EDUCATORS
INTERESTED IN LEARNING
MORE ABOUT EVALUATING
PROGRAM SUCCESS



HOW TO INTERACT TODAY



MEET YOUR PRESENTERS



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TODAY'S PRESENTATION

- ❖ What is NSF INCLUDES?
- ❖ What are broader impacts?
- ❖ Examples of broader impacts
- ❖ Evaluating broader impacts
- ❖ Evaluating BI and sustainability
- ❖ Questions and comments
- ❖ How to learn more

THE EVALUATION PROCESS



HOW MORE

WHAT IS NSF INCLUDES?

- ❖ Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science
- ❖ Three essential components:
 - ❖ Design and Development Launch Pilots (DDLPs)
 - ❖ National Network Coordination Hub
 - ❖ Alliances



WHAT ARE **BROADER IMPACTS**?

BRIEF HISTORY OF BROADER IMPACTS

Between 1981 and 1997 National Science Board had four “generic” criteria for agencies to use in reviewing proposals:

1. Research performer competence
2. Intrinsic merit of research
3. Utility or relevance of the research
4. Effect on the infrastructure of science and engineering

WHAT ARE BROADER IMPACTS?

BRIEF HISTORY OF BROADER IMPACTS

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4. Effect on the infrastructure of science and engineering



NSF & NSB
Task Force



1. Intellectual merit
2. Broader Impacts

WHAT ARE **BROADER IMPACTS**?

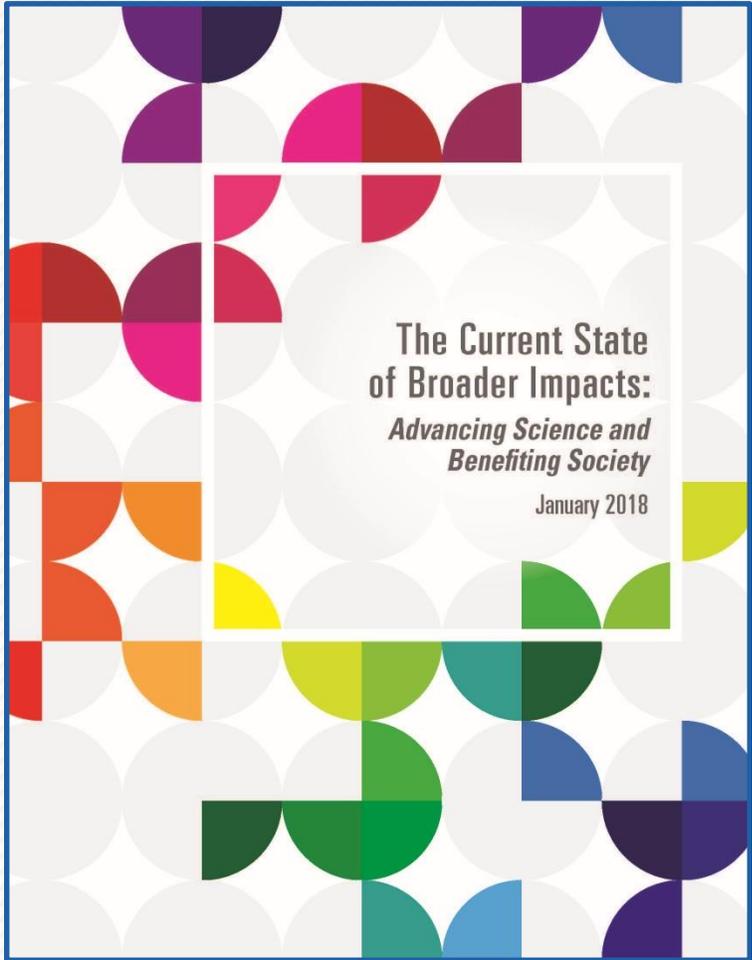
NSF BROADER IMPACTS CRITERION

“**Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes” (PAPPG III.A.2)

“Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to the project. NSF values the advancement of scientific knowledge and activities that contribute to the achievement of societally relevant outcomes.” (PAPPG Part II.2.d.(i))

WHAT ARE BROADER IMPACTS?

NATIONAL ALLIANCE FOR BROADER IMPACTS (NABI)



The Current State
of Broader Impacts:
*Advancing Science and
Benefiting Society*
January 2018



Broader Impacts
criterion is unclear

June 8, 2018

Source: The Current State of Broader Impacts: Advancing Science and Benefiting Society, NABI, January 2018

WHAT ARE BROADER IMPACTS?

TYPES OF BROADER IMPACTS

Full participation of women, persons with disabilities, and underrepresented minorities in STEM

Improved STEM education and educator development at any level

Increased public scientific literacy and public engagement with science and technology

Improved well-being of individuals in society

Development of a diverse, globally competitive STEM workforce

Increased partnerships between academia, industry, and others

Improved national security

Increased economic competitiveness of the United States

Enhanced infrastructure for research and education

More at: <https://broaderimpacts.net/>

NABI
National Alliance for Broader Impacts

Broader Impacts Guiding Principles and Questions for National Science Foundation Proposals

The National Association for Broader Impacts (NABI) Broader Impacts Working Group has developed a guiding document for the National Science Foundation's (NSF) Broader Impacts (BI) criteria. The purpose of this document is to assist NSF program managers, proposal reviewers, and review panels in evaluating the BI component of NSF proposals and to assist proposers with developing their broader impact plans. This document is intended to provide a means for consistency in the way review panels evaluate and rate proposed BI plans.

Types of Broader Impacts: According to the current NSF Merit Review Criteria published in the Grant Proposal Guidelines (see page III 2 III III), the following BI goals may be considered:

- Full participation of women, persons with disabilities, and underrepresented minorities in STEM
- Improved STEM education and educator development at any level
- Increased public scientific literacy and public engagement with science and technology
- Improved well-being of individuals in society
- Development of a diverse, globally competitive STEM workforce
- Increased partnerships between academia, industry, and others
- Improved national security
- Increased economic competitiveness of the United States
- Enhanced infrastructure for research and education

The list above is not exhaustive, and it is not necessary to address more than one goal in a proposal, as long as the broader impact goal is likely to have a desired societal outcome and is well planned. However, the following two elements should be considered in the review process for broader impact activities. Each element has recommended Guiding Principles and Guiding Questions for proposers and reviewers.

TERMS/KEY WORDS

- **Broader Impact (BI) Activity:** A BI activity is a planned experience, engagement, activity, training, etc. that is conducted over a finite period of time for a specific purpose and with a target audience. If the target audience is undergraduate or graduate students, the activities should be in addition to traditional undergraduate coursework or graduate student involvement. If a proposer mentions that s/he will teach an undergraduate class/course or mentor graduate students, this, in itself, would not be considered a broader impact activity. Broader impacts refers to activities that go beyond traditional faculty responsibilities.
- **Engagement:** The PI and/or project team actively and actively involves target audience participants in the proposed BI activity.
- **Evidence-based practices:** Refers to any concept, model, or strategy that is based on or informed by evidence, such as some type of research, metrics, performance, educational research, and already established best practices.
- **Goals:** Goals are the purposes toward which the activity is directed.
- **Impacts:** Describes within or to the target audience/society due to the BI activity as evidenced by measurable or articulated outcomes.
- **Mediate:** Use the identified strategies or interventions will be implemented/used.
- **Outcomes:** Outcomes are the result of goals being successfully achieved. They should be measurable and measured. Outcomes demonstrate changes in awareness, knowledge, skills, attitudes, behavior, motivations, beliefs, values, capacities, or conditions of individuals, groups, organizations, systems, or communities. There can be short term, intermediate, and/or long term outcomes.
- **Practice:** The strategies selected to achieve stated goals.
- **Scalability:** Scalability denotes the potential of a broader impact activity to be applied in other locations, with diverse audiences, or across a wide spectrum of contexts.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. This work is supported by the National Science Foundation under grants ACB-1408306, ACB-1510007, and ACB-1410205. © Copyright 2015, National Alliance for Broader Impacts. All Rights Reserved.

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BROADENING PARTICIPATION IN STEM AND **BROADER IMPACTS**





WHY IS EVALUATION OF BI IMPORTANT?

PROGRAM EVALUATION

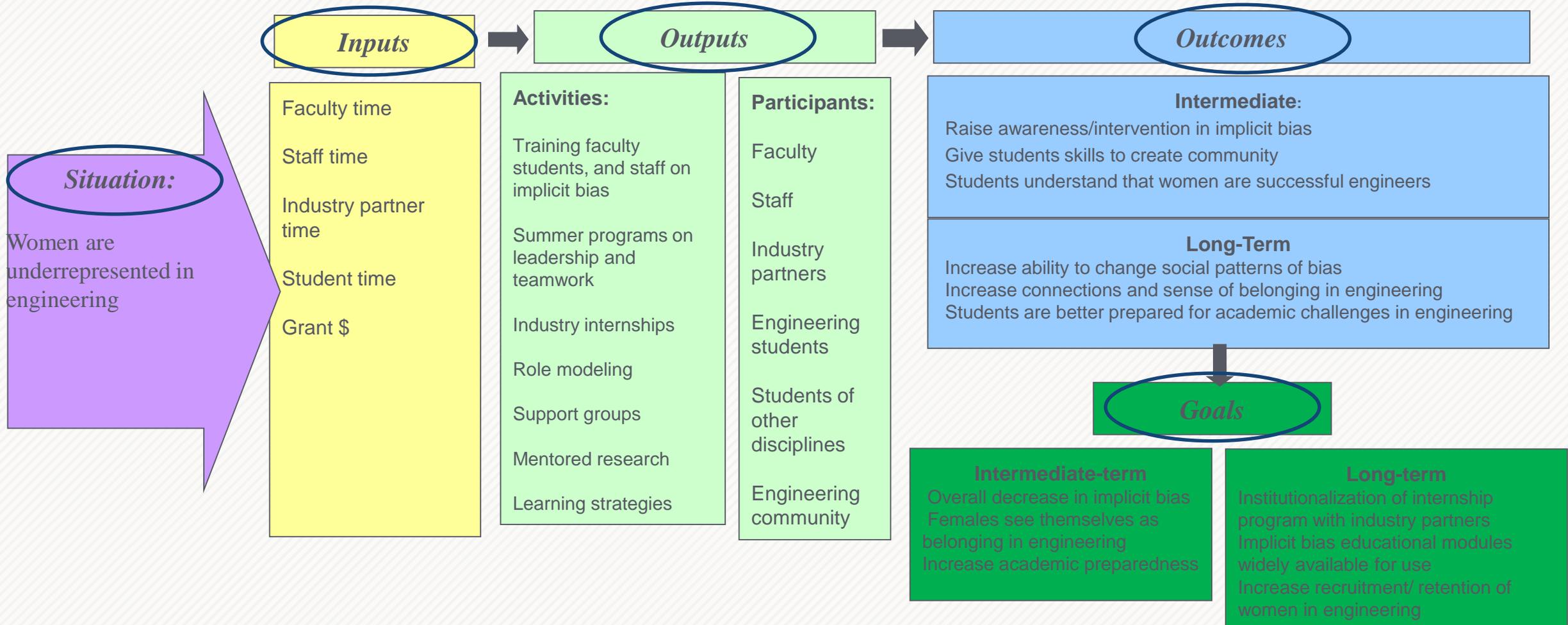
- ✓ Real-time information about your progress toward achieving your broader impacts
- ✓ Make data-based decisions about continuing, stopping, or modifying project activities to make progress towards your broader impacts
- ✓ Measure the reach of your broader impacts
- ✓ Supports plans for sustainability
- ✓ Provides evidence to support future funding





EXAMPLE PROJECT

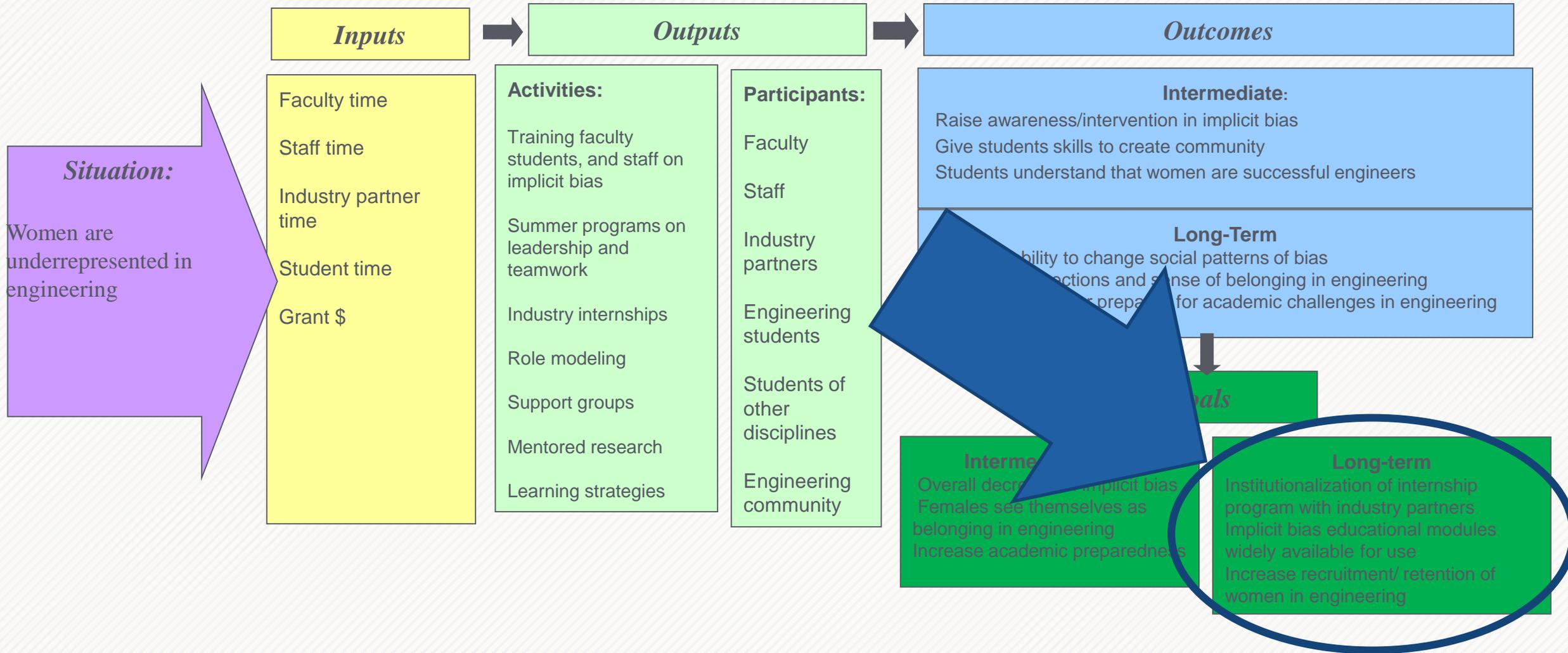
LOGIC MODEL





EXAMPLE PROJECT

LOGIC MODEL



STAKEHOLDER IDENTIFICATION

Participants:

Faculty

Staff

Industry partners

Engineering students

Students of other disciplines

Engineering community

Institutionalization of internship program with industry partners





DEVELOP EVALUATION QUESTIONS FOR BI

BI: INSTITUTIONALIZATION OF INTERNSHIP PROGRAM WITH INDUSTRY PARTNERS

Stakeholders	Evaluation Questions
Industry internship liaisons (Group: Industry partners)	<p>To what extent is their company participating?</p> <p>If they are not participating at the expected level, how could they be incentivized?</p> <p>What changes need to be made so that the industry partner finds the internship program useful?</p> <p>Does the partnering company feel there is a shared vision and purpose between themselves and the project?</p> <p>Does the partnering company feel the project has defined clear roles and responsibilities for the program?</p> <p>What supports does the partner require to continue the program?</p>



DETERMINE DATA COLLECTION PLAN

BI: INSTITUTIONALIZATION OF INTERNSHIP PROGRAM WITH INDUSTRY PARTNERS

Stakeholders	Evaluation Questions	Data Collection Plan
<p>Industry internship liaisons (Group: Industry partners)</p>	<p>To what extent is their company participating?</p> <p>How could they be incentivized to be more invested?</p> <p>What changes need to be made so that the industry partner finds the internship program useful?</p> <p>Does the partnering company feel there is a shared vision and purpose between themselves and the project?</p> <p>Does the partnering company feel the project has defined clear roles and responsibilities for the program?</p> <p>What supports does the partner require to continue the program?</p>	<p>Liaison pre/post survey (before and after orientation, before/after semester of internship)</p> <p>Industry liaison interviews (end of each semester)</p> <p>Industry mentor focus groups (annual)</p> <p>Partnership meeting minutes (annual)</p> <p>Student intern interviews (annual)</p>



DEVELOP EVALUATION QUESTIONS FOR BI

BI: INSTITUTIONALIZATION OF INTERNSHIP PROGRAM WITH INDUSTRY PARTNERS

Stakeholders	Evaluation Questions
<p>Students participating in internships (Group: Engineering students)</p>	<p>What is the quality of interaction with industry mentors and how does it relate to the students' sense of belonging in engineering?</p> <p>Do students feel their participation is valued by the company?</p> <p>To what extent did the student feel they gained technical skills in the internship?</p> <p>How satisfied are students overall with their experience with the internship program?</p> <p>What were the most useful/effective experiences with the internship? Do students feel the program could be of value to other females interested in engineering?</p> <p>Do students feel the internship program is worth continuing?</p>



DETERMINE DATA COLLECTION PLAN

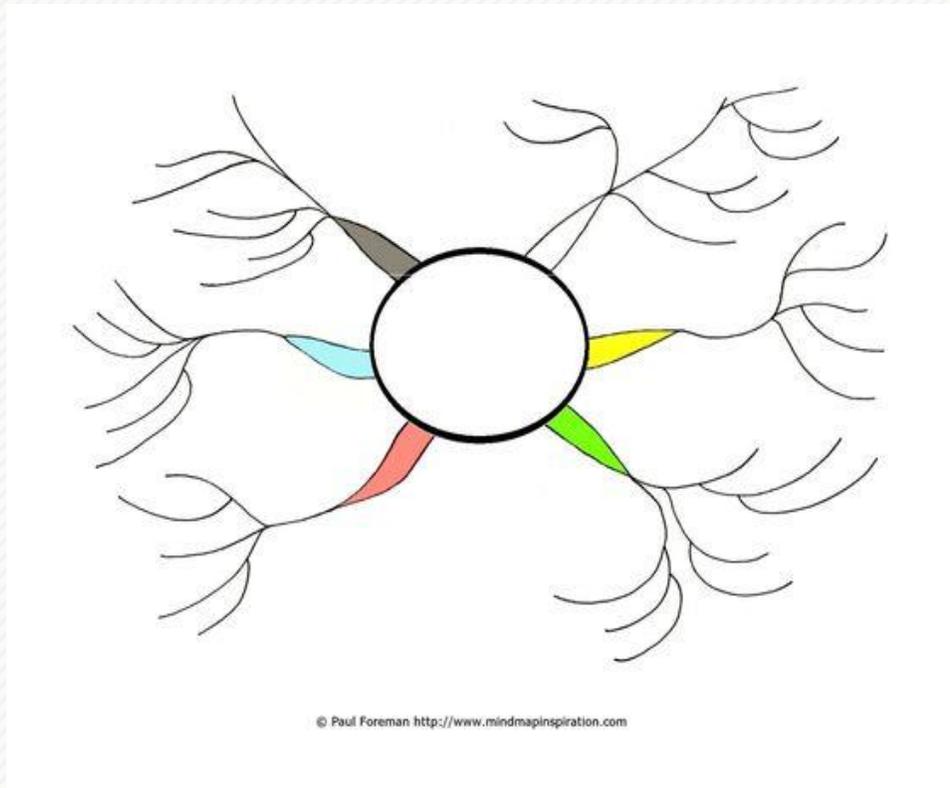
BI: INSTITUTIONALIZATION OF INTERNSHIP PROGRAM WITH INDUSTRY PARTNERS

Stakeholders	Evaluation Questions	Data Collection Plan
<p>Students participating in internships (Group: Engineering students)</p>	<p>What is the quality of interaction with industry mentors and how does it relate to the students' sense of belonging in engineering?</p> <p>Do students feel their participation is valued by the company?</p> <p>To what extent did the student feel they gained technical skills in the internship?</p> <p>How satisfied are students overall with their experience with the internship program?</p> <p>What were the most useful/effective experiences with the internship?</p> <p>Do students feel the program could be of value to other females interested in engineering?</p> <p>Do students feel the internship program is worth continuing?</p>	<p>Student Interviews (one month into the internship, end of internship)</p> <p>Student focus groups (bi-annual)</p> <p>Student surveys (before and after internship, one year follow-up)</p> <p>Review of student internship reports (end of internship)</p> <p>Case studies of student experiences</p>



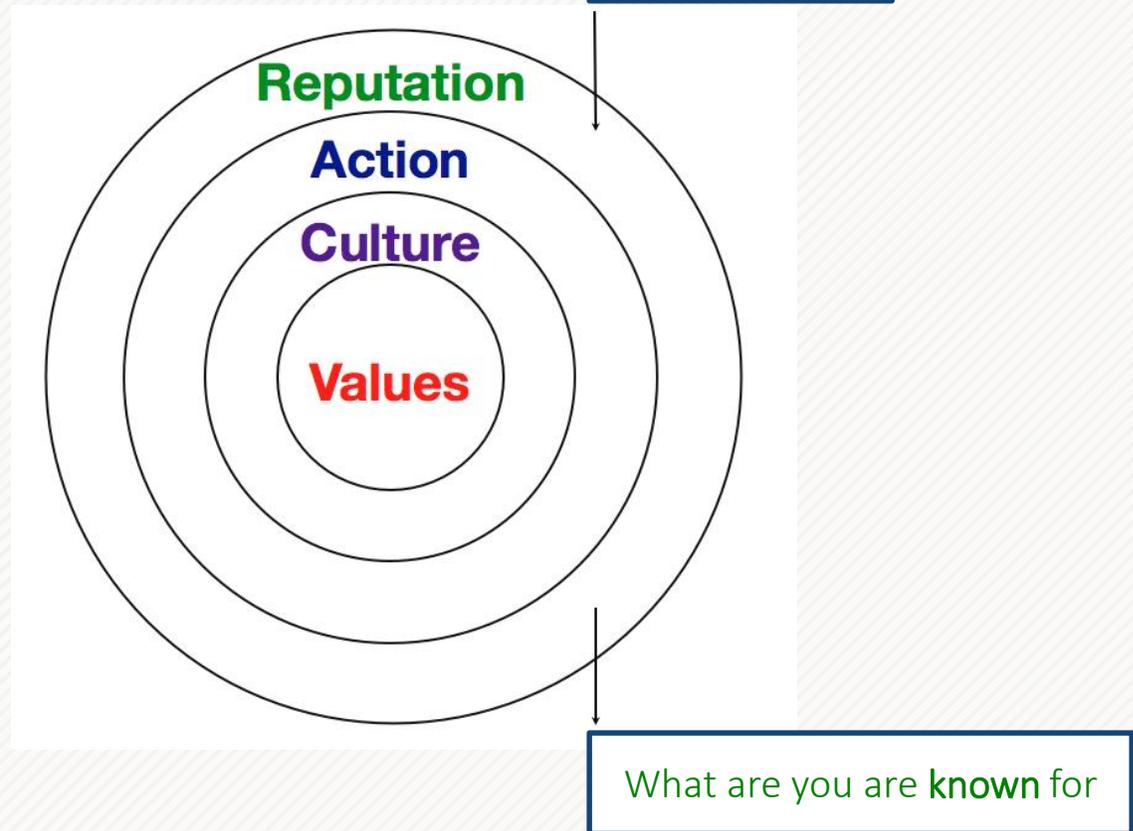
BI EVALUATION AND SUSTAINABILITY

Scalability: The potential of a broader impact activity to be useful in other locations, with diverse audiences, or across a wide spectrum of contexts.



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www.pinsdaddy.com/the-ripple-effect-2020



BI EVALUATION AND SUSTAINABILITY

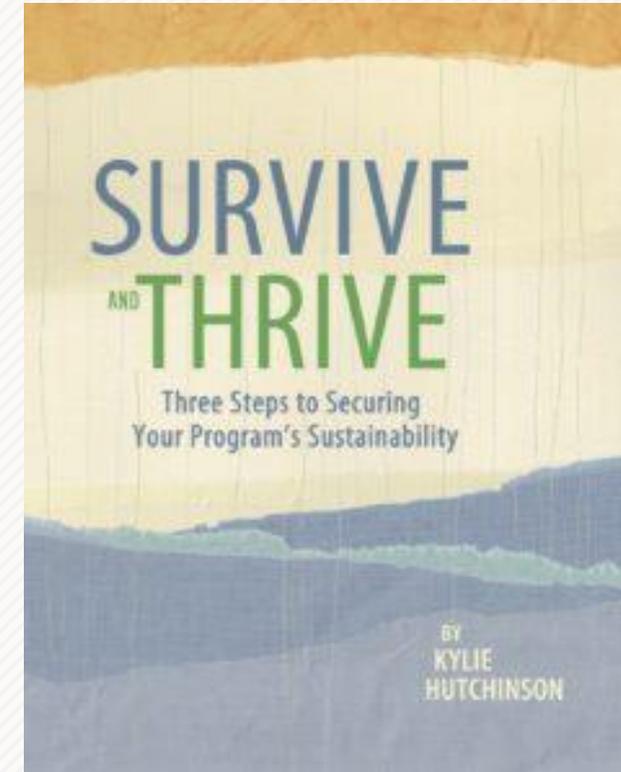
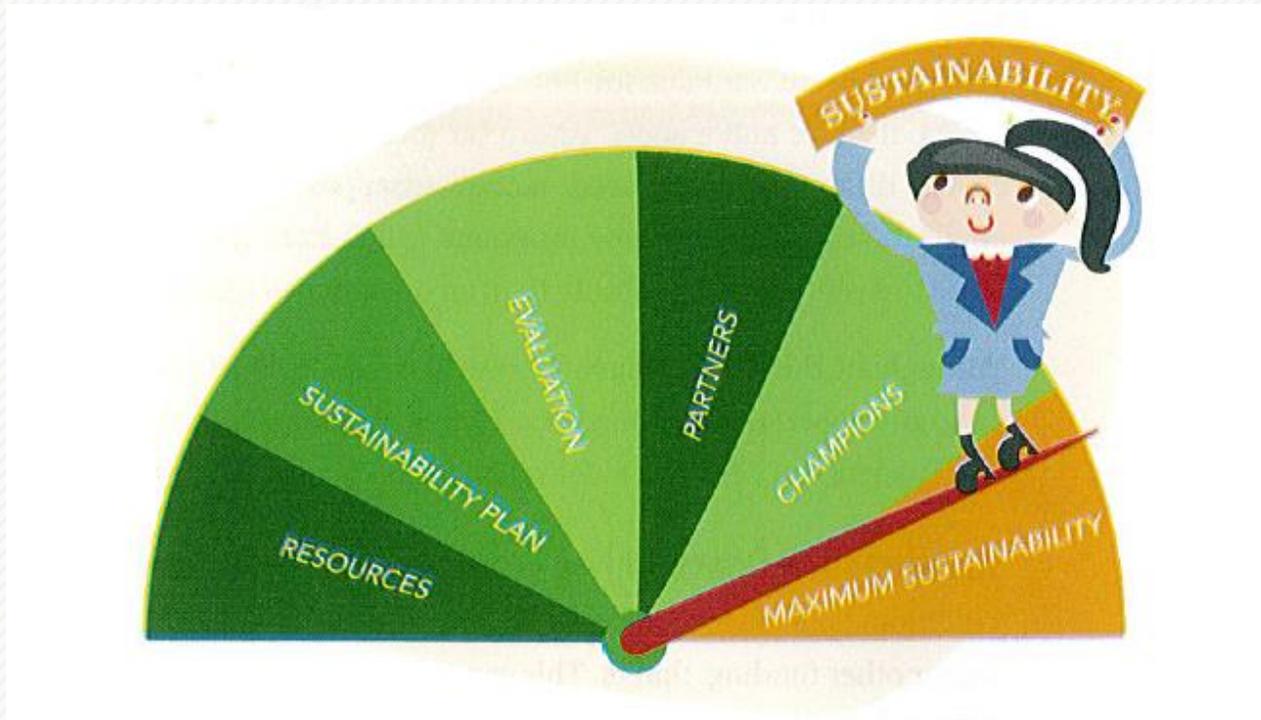


Image source: Hutchinson, K. (2016). *Survive and thrive: Three steps to securing your program's sustainability*. Gibsons, BC: Kylie Hutchinson.



ADDITIONAL RESOURCES FOR BROADER IMPACTS

General Information

National Alliance for Broader Impacts: <https://broaderimpacts.net/>

Perspective on Broader Impacts: https://www.nsf.gov/od/oia/publications/Broader_Impacts.pdf

NSF Proposal and Award Policies and Procedure Guide (PAPPG):

https://www.nsf.gov/pubs/policydocs/pappg18_1/index.jsp

COSEE Broader Impacts Wizard: <http://www.cosee.net/about/highlights/broaderimpacts/biwizard/>

Evaluation Resources

Betterevaluation.org

Informalscience.org

STEM Learning and Research Center: stellar.edc.org

Other Broader Impacts Offices & Centers

The Connector – University of Missouri: <http://theconnector.missouri.edu/>

Broader Impacts in Research – University of Oklahoma: <http://bir.ou.edu/>

The Science Center – Brown University: <https://www.brown.edu/academics/science-center/outreach/support-faculty/broader-impacts/broader-impacts>

Broader Impacts Resource Center – Penn State University: <http://broaderimpacts.psu.edu/>



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THE EVALUATION PROCESS



HOW TO LEARN MORE



HOW TO LEARN MORE

VISIT OUR INCLUDES CONFERENCE WEBSITE:

WWW.NIMBIOS.ORG/INCLUDESCONF

NISER RESOURCES



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