NSF Broader Impact Information

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The National Science Foundation Merit Review Criteria

Information pulled from websites listed above

In 1997, the National Science Foundation (NSF) updated the merit review criteria used to evaluate research proposals for allocating funds. The criteria are:1

A. The Intellectual Merit Criterion:

***What is the intellectual merit of the proposed activity? ***

1) How important is the proposed activity to **advancing knowledge and understanding** within its own field or across different fields?
2) How well **qualified is the applicant** (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.)
3) To what extent does the proposed activity suggest and explore **creative and original** concepts?
4) How well **conceived and organized** is the proposed activity?
5) Is there sufficient access to **resources**?

B. The Broader-Impacts Criterion:

What are the broader impacts of the proposed activity? NSF staff will give careful consideration to the following in making funding decisions:

1) How well does the activity **advance discovery and understanding** while **promoting teaching, training, and learning**?
2) How well does the proposed activity broaden the participation of **underrepresented groups** (e.g., gender, ethnicity, disability, geographic, etc.)?
3) To what extent will it **enhance the infrastructure** for research and education, such as facilities, instrumentation, networks, and partnerships?
4) Will the results be **disseminated broadly** to enhance scientific and technological understanding?
5) What may be the **benefits** of the proposed activity to society?

C. Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students, and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

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The Broader-Impacts Criterion – EXAMPLES of ACTIVITIES

(from above)

B.1) Advance Discovery and Understanding While Promoting Teaching, Training and

Learning

• Integrate research activities into the teaching of science, math and engineering at all educational levels (e.g., K-12, undergraduate science majors, non-science majors, and graduate students).
• Include students (e.g., K-12, undergraduate science majors, non-science majors, and /or graduate students) as participants in the proposed activities as appropriate.
• Participate in the recruitment, training, and/or professional development of K-12 science and math teachers.
• Develop research-based educational materials or contribute to databases useful in teaching (e.g., K-16 digital library).
• Partner with researchers and educators to develop effective means of incorporating research into learning and education.
• Encourage student participation at meetings and activities of professional societies.
• Establish special mentoring programs for high school students, undergraduates, graduate students, and technicians conducting research.
• Involve graduate and post-doctoral researchers in undergraduate teaching activities.
• Develop, adopt, adapt or disseminate effective models and pedagogic approaches to science, mathematics and engineering teaching.

B.2) Broaden Participation of Underrepresented Groups

• Establish research and education collaborations with students and/or faculty who are members of underrepresented groups.
• Include students from underrepresented groups as participants in the proposed research and education activities.
• Establish research and education collaborations with students and faculty from non-Ph.D.-granting institutions and those serving underrepresented groups.
• Make campus visits and presentations at institutions that serve underrepresented groups.
• Establish research and education collaborations with faculty and students at community colleges, colleges for women, undergraduate institutions, and EPSCoR institutions.
• Mentor early-career scientists and engineers from underrepresented groups who are submitting NSF proposals.
• Participate in developing new approaches (e.g., use of information technology and connectivity) to engage underserved individuals, groups, and communities in science and engineering.
• Participate in conferences, workshops and field activities where diversity is a priority.

B.3) Enhance Infrastructure for Research and Education

• Identify and establish collaborations between disciplines and institutions, among the U.S. academic institutions, industry and government and with international partners.
• Stimulate and support the development and dissemination of next-generation instrumentation, multi-user facilities, and other shared research and education platforms.
• Maintain, operate and modernize shared research and education infrastructure, including facilities and science and technology centers and engineering research centers.
• Upgrade the computation and computing infrastructure, including advanced computing resources and new types of information tools (e.g., large databases, networks and associated systems, and digital libraries).
• Develop activities that ensure that multi-user facilities are sites of research and mentoring for large numbers of science and engineering students.

B.4) Broad Dissemination to Enhance Scientific and Technological Understanding

• 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.
• 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.

B.5) Benefits to Society

• Demonstrate the linkage between discovery and societal benefit by providing specific examples and explanations regarding the potential application of research and education results.
• Partner with academic scientists, staff at federal agencies and with the private sector on both technological and scientific projects to integrate research into broader programs and activities of national interest.
• Analyze, interpret, and synthesize research and education results in formats understandable and useful for non-scientists.
• Provide information for policy formulation by Federal, State or local agencies.

C) Integration of Research and Education

• Integrate research activities into the teaching of science, math and engineering at all educational levels (e.g., K-12, undergraduate science majors, non-science majors, and graduate students).
• Include students (e.g., K-12, undergraduate science majors, non-science majors, and /or graduate students) as participants in the proposed activities as appropriate.
• Participate in the recruitment, training, and/or professional development of K-12 science and math teachers.
• Develop research-based educational materials or contribute to databases useful in teaching (e.g., K-16 digital library).
• Partner with researchers and educators to develop effective means of incorporating research into learning and education.
• Encourage student participation at meetings and activities of professional societies.
• Establish special mentoring programs for high school students, undergraduates, graduate students,and technicians conducting research.
• Involve graduate and post-doctoral researchers in undergraduate teaching activities.
• Develop, adopt, adapt or disseminate effective models and pedagogic approaches to science, mathematics and engineering teaching.

Answers to Broader Impact Questions

Are Broader Impacts weighed equally with Intellectual Merit?

No. Broader impacts are given different weights in different divisions and by different reviewers. There is no universal formula for determining how important BI is in the final decision wether to fund a program or not.

Can I hire someone to do my Broader Impacts?

There's a fine line between leveraging expertise and trying to get out of doing something yourself. Most reviewers can tell the difference. The Broader Impacts are supposed to be the Broader Impacts of the proposed research, so you and/or members of your research group need to have some intellectual contribution. If you can leverage an existing program that already has infrastructure -- connections with schools, for example, you may have more impact than if all your time is spent trying to find teachers to work with.

What makes a good Broader Impact?

One of the problems with BI is that some reviewers aren't quite sure what to do with it. Many know when they don't like something, or when a project is obviously contrived or doomed to failure; however, identifying what is good is a little more subjective. The best suggestions culled from the Broader Impacts Workshop are

1. The project has to fit with the research. Proposing something totally separate from the research doesn't make sense
2. Take advantage of your local strengths. If you have a long-running program of science lectures for the public, see if you can get involved in that instead of starting your own program -- just make sure you make it clear that you are contributing something, not freeloading
3. If you're going to propose something for the classroom, be aware of the literature in research on teaching and learning. We know a lot more about what works and what doesn't than we used to
4. Don't make a laundry list of activities trying to impress people with how much you're doing. The list of activities NSF put out is not a menu where you choose one from each column. Quality over quantity
5. Reviewers more and more want to see that you're making an effort to determine whether what you are doing works. You need to have some way to assess your activity and determine whether it is making an impact. (You ought to want to know this anyway so you don't waste your time doing something that is useless.)
6. Have a goal -- state clearly what you want to happen as a result of the activity (besides getting your research funding)

7. Reviewers are consistently inconsistent. Even if you follow all these suggestions, you still are likely to have someone criticize your activity. NSF badly needs to give reviewers more direction on whether they expect BI to be innovative, or whether implementing something we know works is sufficient.

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QUESTIONS FOR WORKING IN K-12

A sample of the types of questions that a scientist interested in working in K-12 should ask himself or herself prior to starting on the project.

Questions if you are planning on working with teachers

1) What do the teachers need?
2) What do I have to offer that would meet the needs of the teachers
3) What skills/resources are necessary to carry out my idea?
4) Do I have the needed skills/resources? If not, who can I involve to help me? What do I need to provide those people (funding? information?) so that the experience is rewarding for them as well?
5) How does my content area relate to national and state standards?
6) Do I understand the constraints facing the teacher (time, topic, high-stakes testing, etc.)
7) Am I considering the teachers as equal partners in this enterprise? Are they professional colleagues/collaborators?
8) What do I expect to gain from doing this project? (Knowledge? Building relationships for future students? Sense of satisfaction?)
9) Do I have a good understanding of the impact this project is likely to make? For example, oneshot visits to a classroom don't have particularly lasting impact. Is there an existing program that might utilize my experience in a more effective manner?
10) Am I aware of other projects similar to what I'm thinking about doing? What have they learned that I might take advantage of?

Questions for working with K-12 students:

1) How does this fit in with state standards, curriculum, testing schedules, time available?
2) What do students already know?
3) What are the teachers' and students' needs?
4) What else is being done by others (locally and nationally). Are there opportunities to collaborate?
5) Who are the pertinent contacts? Teachers? Principals? Are there local requirements that must be satisfied before sending anyone into the schools (i.e. background checks, informing them of proper dress codes?)
6) Do you understand the environment of the school(s) with which you want to work? (Cultural differences)
7) What are your own goals? How will you accomplish the goals? How will you evaluate whether you've met your goals?

8) Do you understand school policies and procedures?
9) Do you know what the ‘touchy’ subjects are in your district? What are the policies on teaching evolution?
10) How do teachers in your target school teach? The lecturing or demonstration you are used to doing may not be appropriate for some classrooms.