

National Science Foundation



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“The major challenge facing contemporary higher education is to enhance its relevance and connectedness to the issues and problems faced by the broader society – as these problems are defined by community members, and not by academics acting independently of the views of others.” (Kenny et al. 2002)

Basic Premise

The broader societal goals of NSF, expressed both in the NSF strategic plan and GPRA goals and in our instructions to proposers, can only be achieved if the research we support is conducted within institutions that have embraced the habits of engagement and if researchers care about the educational implications of their work.

- ◆ What does the integration of research and education mean?
- ◆ What is engagement and how is it different from outreach?



Integration of Research and Education

- ♦ **Fostered by the programs, projects and activities that NSF supports;**
- ♦ **Individuals can concurrently assume responsibilities as researchers, educators and students who jointly engage in infusing education with the excitement of discovery**



Approaches to Integration of Research and Education

Research creates an educational asset.
How will this asset be used?

- Direct participation in research
- Use of research on learning to design activities/programs
- Research experiences for all students
- The use of research mindset in the classroom
- Public understanding of research/science



Engagement

- ◆ Shared goals
- ◆ A shared agenda
- ◆ Shared definitions of success
- ◆ Shared resources
- ◆ Mutually beneficial
- ◆ Buildings capacity of all parties and draws upon strengths of each
- ◆ Used for complex questions for which there are no well-researched answers.
 - a. Type 1: clear questions-unclear answers.
 - b. Type 2: unclear questions-unclear answers.



Outreach

1. Primarily the transfer of knowledge from an expert to a client.
2. The pattern of questions provides input to a research agenda.
3. Generally used for fairly straightforward questions for which there are well-researched answers.





Characteristics of Good Collaboration

- Take time to understand different cultures/ways of doing things.
- Draw upon the distinctive strengths of each partner.
- Agree upon a shared agenda—do not drive the priorities from the point of view of the researchers only.
- Build on the distinctive features of each school. There is no such thing as a “typical” school.



Characteristics of Good Collaboration

- Be willing to change as experience dictates.
- Avoid partnering one place to death.
- Many smaller partners lack infrastructure to engage. It may be necessary to build an infrastructure to sustain collaboration.
- Begin early to recruit new players. Fatigue can set in early.
- Be guided by a culture of evidence throughout the course of the collaboration.

Why is the Integration of Research and Education so Hard?

Barrier One: The attitudes of STEM faculty

Barrier Two: The different world views and expectations of K-12 educators, education faculty and STEM faculty

Barrier Three: How research is done

Barrier Four: How we prepare our future faculty and the nature of becoming a scholar

Barrier Five: How we prepare our teachers and their expectations of themselves as professionals

Barrier Six: Lack of institutional support and infrastructure

Barrier Seven: Lack of rigorous evaluation of the quality and impact of such work





Features of an Effective K-16 Partnership

- (a) an expectation that PK-12 and higher education will work together to address educational issues in PK-12;
- (b) a requirement that faculty in mathematics and the sciences and engineering as well as faculty from education programs will be meaningfully involved in preparing teachers, in developing programs for the professional development of teachers and in defining goals and approaches to the development and implementation of high quality PK-12 science and mathematics curriculum;



Features of an Effective K-16 Partnership

(c) participation of research active faculty who take educational issues seriously and who will apply the same rigor and intensity to educational questions as they do to their research agenda; and

(d) a concerted effort must be made to build a strong research community interested in the nature of learning and in educational reform at all levels, including PK-12. These are serious demands and it is not clear that each sector of higher education is prepared to embrace its role in PK-12. Fortunately, some institutions, including many that play especially important roles in the preparation of teachers for their regions and their states, have strongly accepted the challenge of working with PK-12.

Questions

1. The joint AC mini-symposium believes that a great proportion of the education and outreach activities operated from NSF-funded research projects function under the constraints implicit in being an “add-on.” This situation is only going to be intensified as researchers respond to Important Notice 127. Forced to operate under “add-on” constraints, education and outreach programs often:





- are unfocused and uncoordinated in their goals and program strategies;
- cannot offer the sustained programming that fosters faculty and teacher investment;
- operate with little if any of the benefits provided by evaluation and benchmarking;
- are unable to address key workforce issues; and
- generally are not able to optimize the use of scientists' and teachers' time and effort.



2. Do you concur with this assessment of the situation for education and outreach programs? If so, how might MPS and EHR help the members of the STEM research community and their institutions avoid these pitfalls of “add-on” education and outreach programs?



3. Most STEM researchers do not have the training and skills to respond effectively to NSF's Review Criterion 2 on their research proposals, and to develop effective proposals that focus on education and outreach and that effectively integrate these activities with the research enterprise. How can EHR and MPS work together to address these challenges?



4. Understanding how to, and finding the time to, “cross the boundaries” between disciplines is a key to achieving NSF’s goal of integrating research and education. Incorporating evaluation into NSF projects is proving useful as a “boundary crossing” strategy. What strategies do you suggest MPS and EHR might use to more effectively cross their own boundaries at NSF, and to further help STEM and education researchers to cross boundaries at their institutions?