

The Engaged University:  
Integrating Research, Education and Community Service  
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Since I am at the National Science Foundation, it will not surprise you that I will talk about how a research university that embraces civic engagement can change the nature of the undergraduate experience for students who are interested in science, technology, engineering and mathematics (STEM). However, I will start with a broader perspective and then turn to science. By bringing together the experiences of education, research and community service, conditions can be set that can achieve our Greater Expectations for all of our students. I am starting with the undergraduate experience writ large because of my deep conviction that the undergraduate study of science, engineering and mathematics can and must be approached as an experience in liberal education.

I use the term **Greater Expectations** because it is the title of the two year project on undergraduate education sponsored by the Association of American Colleges and Universities with the support of several Foundations, including the Pew Charitable Trusts and the Carnegie Corporation. I had the privilege of chairing the national panel whose report was just issued this fall.

To define liberal education, I will use the ideas developed by the Greater Expectations panel:

“A philosophy of education that empowers individuals, liberates the mind, and cultivates social responsibility. Characterized by challenging encounters with important issues, and more a way of learning than specific content, liberal education can occur in all disciplines. This concept is different from the term “liberal arts” which refers to specific disciplines in the humanities, social sciences and sciences.”

As a panel, we asked ourselves

- What should be higher education’s role today and for the near future?
- What are the central aims and essential practices of college study?

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<sup>1</sup> The ideas in this paper are those of the author and do not necessarily represent the position of the National Science Foundation.

- How can an undergraduate education benefit not only the individuals who attend our institutions but also society at large?

After rich and probing exploration of these issues, we came to a common set of goals for a liberal education. We made recommendations about what all students should know--- regardless of their backgrounds or their fields of study or their choice of institution. We call for all students to become “INTENTIONAL learners who can adapt to new environments, integrate knowledge from different sources, and continue to learn throughout their lives ( Greater Expectations p. xi) To thrive in a complex world, our students must also become:

“EMPOWERED through the mastery of intellectual and practical skills;  
INFORMED by knowledge about the natural and social worlds and about forms of inquiry basic to these studies;  
RESPONSIBLE for their personal actions and for civic values.

The report goes on to explain how a student might exhibit these basic traits of an educated person and prepare to lead a responsible, productive and creative life.

I have entitled my remarks “The Engaged University: Integrating Research, Education and Community Service” because there is increasingly strong evidence that educational experiences that engage students in discovery, interpretation of knowledge and the responsible application of knowledge to meaningful problems can provide the means by which students can become  
INTENTIONAL, EMPOWERED, INFORMED AND RESPONSIBLE.

Closer to our own agenda at NSF, these experiences also appear to strengthen interest in science, engineering and mathematics and encourage undergraduates to complete degrees in these fields and go on to pursue advanced study.

**The mission of NSF is**

To **promote** the progress of science; to advance the national health, prosperity and welfare;...and to initiate and support basic scientific research and programs to strengthen scientific research potential and science education programs at all levels (source: National Science Foundation Act, 1950)

**Through** discovery, learning and innovation that will ensure that the nation has the people, ideas and tools necessary for a healthy science and engineering enterprise;

**Achieved** through the core NSF strategies of development of intellectual capital, integration of research and education and the promotion of partnerships;

**In order to** (a) make it possible for the U.S. to uphold a position of world leadership in all aspects of science and engineering; (b) promote the discovery, integration, dissemination and employment of new knowledge in service to society; and (c) achieve excellence in U.S. science, technology, engineering and mathematics education, (source: NSF GPRA Strategic Plan, FY 2001-2006)

NSF approaches the enhancement of STEM education by employing a series of strategies that work from the individual to the ideas and tools that individuals can utilize. The logic then grows in magnitude from networks of researchers and practitioners through the institutional environments in which STEM professionals work to the larger societal context that shapes the options available to both individuals and institutions.

**Individuals**

To enhance the capabilities of individuals preparing for STEM careers (including science and math teachers) and people currently in the workforce and to attract a diverse group of people into the STEM workforce.

**Ideas and Tools**

To develop ideas, tools and communication strategies that will enhance the quality of STEM education; inform all citizens about science, technology and mathematics; and enhance public understanding of current research and its implications.

### **Networks of researchers and practitioners**

To support the development of connections among networks of researchers and practitioners that will create the capacity to generate and sustain change in order to enhance the quality of education and broaden participation in STEM careers.

### **Institutional Environments**

To develop institutional environments that support and encourage change and the introduction of strategies that will enhance the preparation and development of the STEM workforce, while creating the capacity and infrastructure that will support collaboration across disciplines and across institutions.

### **System Level Interactions**

To create a supportive context for improvements in STEM education through interactions and partnerships that will promote excellence in STEM education and to facilitate the application of knowledge and innovative strategies to economic and community development that derives from science and technology.

There are a number of ways that NSF is seeking to create the capacity for change, both through its own efforts and through the research collaborations that it supports.

Our educational portfolio depends upon a few core concepts.

- 1) The integration of research and education

- 2) broadening of participation in STEM
- 3) effective use of partnerships across the disciplines and across institutions, including a strong emphasis on collaborations between higher education and K-12.
- 4) support for the development of engaged campuses

In the process we are learning to work this way ourselves within the context of NSF. We are seeking to model within NSF the behaviors that have been shown to create the capacity for collaboration and change

- by increasing the opportunities for collaboration between EHR and the research and related (R&RA) directorates at NSF;
- by increasing the partnerships between K-12 programs and higher education programs within EHR itself;
- by requiring all proposals submitted to NSF to address the broader implications of the work proposed (the second merit criterion or broader impacts criterion);
- by rethinking what it means to promote the discovery, integration, dissemination and employment of new knowledge in service to society;
- by building research capacity into every major program within the EHR directorate and exploring the implications of the integration of research and education strategy, both within this directorate and in our working relationships with the major NSF-supported research Centers (Science and Technology Centers, Engineering Research Centers, Materials Science Research and Engineering Centers);
- by creating the characteristics of a learning community within NSF ;
- by basing our strategies and program designs on a solid culture of evidence drawn from both research and the wisdom of practice.

What do these basic ideas mean?

### **The key idea is the concept of Integration of Research and Education**

“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)

“Research and education are not---and never have been---mutually exclusive realms. (from GPRA Strategic Plan FY 01-06; core strategies)

“Effective integration of research and education at all levels infuses learning with the excitement of discovery. Joining together research and education also ensures that the findings and methods of research are quickly and effectively communicated in a broader context and to a larger audience.” (GPRA Strategic Plan FY 01-06)

#### **Premise.**

My basic premise is that *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 and education we support is conducted within institutions that have embraced the habits of engagement and if researchers care about the educational implications of their work.

To make this case, I will explore in depth what the integration of research and education can mean, what engagement means, the capacities required to operate in an engaged mode, and why partnerships of the kind we are now calling for in the priority area “Learning for the 21<sup>st</sup> Century Workforce” and, in particular, in the Math Science Partnership and the anticipated Science of Learning Centers are so important. Although we are talking about the undergraduate experience today, the ideas can apply equally well to other work supported by NSF that develop within collaborative or partnership modes and that involve multiple participants with different expectations, cultural experiences and assets. In fact, even collaborations involving several disciplines or academic departments may face of these same challenges.

## **How NSF Describes its Expectations<sup>2</sup>**

### (1) What is the intellectual merit of the proposed activity?

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

### (2) 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? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

NSF staff will give careful consideration to the following in making funding decisions:

### (3) 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.

### (4) Integrating Diversity into NSF Programs, Projects, and Activities

Broadening opportunities and enabling the participation of all citizens - women and men, underrepresented minorities, and persons with disabilities - are essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

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<sup>2</sup> Source: NSF Grant Proposal Guide, January 2, 2002

There are at least four ways to interpret the idea of integration of research and education. Only two of these are mentioned in the material provided in the proposal guide, although three of them could readily be adopted by a research team in their interactions with the larger community and all apply to the undergraduate experience.

- 1) Whenever we invest in research capacity, we are creating an educational asset. This asset can be deployed in a number of ways: to provide research experiences for undergraduate students, high school students and high school and middle school teachers<sup>3</sup> and to promote public understanding of science, research and technology. In some instances, the research activities themselves can be designed in such a way that the general public can also contribute to the work, through gathering of observations and data.
- 2) The results of research on cognition, learning and development can be incorporated into educational practice to promote more effective approaches to teaching and learning. This can be most effectively accomplished when researchers and practitioners work together to define problems of special importance, gather data and interpret those data. This process of collaborative research also facilitates the application of research findings to practice while making it possible for the realities of practice to challenge theory and define research goals. One necessary condition for the integration of knowledge about learning into education is the attitude of faculty and teachers toward the integration of research and education itself. *Researchers must take education seriously and educators must take research seriously.*
- 3) In some instances, research can be incorporated into the design of educational experiences for all students, not just those who can be accommodated on a research team or in a field or laboratory research project. This can be done

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<sup>3</sup> According to colleagues in ESIE, best practice research shows that research experiences make the most sense for secondary teachers and middle school teachers who have specialized in one or more specific academic areas. These teachers have a better opportunity to translate their experiences into their classroom work. PreK-6 teachers are more generally prepared and do not easily fit into traditional research environments. That said, it makes sense to involve preK-6 teachers in other ways in experimentation with approaches to work in the classroom.

through such pedagogies as service-learning, inquiry-based learning, project-based learning.

- 4) In all cases, a scientific mindset and an approach that promotes quantitative literacy can be introduced into the classroom so that students learn in a mode comparable to that employed by an investigator, even if the work they are doing is not an original contribution.

### **Broadening Participation (Integrating Diversity)**

The concept of broadening participation can be examined from the perspective of individuals, disciplines, institutions, and regions of the country.

- 1) Individuals: Ensuring that support is provided for a diverse group of talented people to pursue STEM careers.
- 2) Disciplines: Promoting the involvement of a range of disciplinary perspectives in the conduct of both research and education.
- 3) Institutions: Encouraging institutions with different missions and characteristics to become involved in NSF sponsored programs.
- 4) Regions: Investing in greater capacity for each state to be a contributor to the nation's STEM research and education capacity.

### **The Concept of Engagement: What does it mean to integrate research and education in an engaged mode?**

*Engagement* refers to an initiative characterized by shared goals, a shared agenda, agreed upon definitions of success that are meaningful both to the university and to the community participants, and some pooling or leveraging of university resources and public and private funds provided by other participants. The resulting collaboration or partnership is mutually beneficial and is likely to build the capacity and competence of all parties. To be successful, partnerships must build on the strengths of the participants and

there must be reasonable complementarity of what each can contribute to the overall goals of the collaboration. This reciprocity is the core concept underlying the design of the Mathematics and Science Partnership (MSP).

Engagement can be distinguished from *outreach*, a model developed in the early days of the development of the land-grant mission and originally supported by a series of cooperative extension offices and agents. In this model, experts apply their knowledge to problems brought to them by people in the community. The patterns of these questions and concerns provide input to a research agenda, originally maintained by agricultural field stations. Outreach is primarily the transfer of knowledge from a university agent to a client. Although the infrastructure needed to sustain outreach has evolved beyond cooperative extension, and, indeed, coop extension itself has evolved to include programs for children and families as well as small business, it is still primarily one-way rather than a shared enterprise.

Higher education institutions will usually elect to use outreach for fairly straightforward questions and problems and will initiate engagement activities to address more complex issues that lack clarity (i.e. unclear problems where either the question or the solutions are unclear) or issues that must be explored with the use of leveraged funding from multiple parties. An excellent example of the kind of problem for which an engagement strategy is ideally suited is the issue of PK-12 reform, and, in particular the improvement of teaching and learning in science and mathematics.

### **The Engaged Institution**

The engaged university is committed to direct interaction with external constituencies and communities through mutually-beneficial exchange, exploration, and application of knowledge, expertise, resources and information. These interactions enrich and expand the learning and discovery functions of the academic institution while also enhancing community capacity. The work of the engaged institution is responsive to (and

respectful of) community-identified needs, opportunities, and goals in ways that are appropriate to the campus' mission and academic strengths.

For this approach to work, the other organizations with which a university is affiliated must also have the capacity for engagement including strong leadership, some appropriate infrastructure and the time and means to participate in collaborative ventures. In fact, in many ways, the barriers to engagement that are often identified by faculty are problems for pK-12, government agencies, and the business community as well. Obstacles often mentioned by faculty who have been considering becoming involved in engaged scholarship and teaching are “the time it takes to create new activities, cultivate partnerships, organize the logistics of service activities, and recruit students or other participants (Holland 1999).

Engaged institutions, no matter what the foci of their interests or the pathways by which they arrive at substantial engagement, share some common characteristics, adapted from (Bringle & Hatcher, 2001; Holland, 2001; Ramaley 2002)

1. Civic engagement is articulated in the institutional mission and strategies. Public perspectives and needs consistently influence campus priorities.
2. The campus involves the community in continuous, purposeful and authentic ways and listens carefully to what community members have to say.
3. The curriculum contains a variety of ways for students to learn in ways that engage them in community concerns.
4. The campus thinks carefully about the consequences of all of its decisions on its relationship with the community and its capacity to collaborate with the community.
5. The institution has a policy environment and appropriate infrastructure and investment to promote, support and reward engagement.
6. Individuals throughout the campus community play leadership roles in fostering engagement. This is especially important in order to ensure that a

commitment to engagement will survive leadership transitions at presidential, provost and decanal levels.

7. The campus approach to scholarship includes support of interdisciplinary work, since societal issues do not come in “disciplinary form.”
8. The campus honors and makes visible its engagement work, both internally and externally.
9. Engagement activities are held to high standards of excellence and are rigorously evaluated.

To undertake genuine engagement, an institution must be willing to open itself up to the possibility that it, too, will change and will learn from the experience. The element of an engaged partnership that is especially hard to achieve is the experience of genuine mutuality. The experience of engagement, however, may result in a different conception of a research university, the engaged institution that was envisioned by the Kellogg Commission on the Future of State and Land-Grant Universities.

The experience of engagement will become the pathway to a fresh interpretation of the role of higher education in the 21<sup>st</sup> century. This conception rests on a rethinking of the core of the academy---namely, the nature of scholarship itself and our expectations for the undergraduate experience. The goal of engaged scholarship is not to define and serve the public good directly on behalf of society, but to create conditions for the public good to be interpreted and pursued in a collaborative mode with the community. In contemporary society, the exercise of citizenship requires constant learning and the thoughtful and ethical application of knowledge. By including our students in engaged scholarship, we introduce them to these basic concepts and offer them a chance to experience them in the company of mature scholars and practitioners.

During its examination of the future of this nation’s state and land-grant institutions, the Kellogg Commission on the Future of State and Land-Grant Universities reframed the classic triad of *research*, *teaching* and *service* into a new framework of *discovery*, *learning* and *engagement*. The reason for doing this was that the new terms

describe shared activities, usually, but not always, led by faculty, that have shared consequences. The older terms tend to connote a one-way activity, generally conducted by experts. The new triad works well for describing the range of ways in which a college or university can incorporate good citizenship into its traditional work and move from an expert-centered model to an engagement model of partnership with the community.

**Discovery** can encompass community-based scholarship and the development of new knowledge through collaborations with community participants. **Learning** can be done in a way that links educational goals with the challenges of life. As John Dewey wrote, “Education is not preparation for life. Education is life itself.” Common forms of engaged learning are service-learning and problem-based learning, both utilizing community issues as a starting point for accomplishing educational goals. **Engagement** can be achieved through community-university alliances and partnerships and can support any combination of scholarly activity including discovery, integration and interpretation and application.

All three of these classic elements of campus life---research, teaching and service ---can be conducted in an “engaged mode.” Whether it is discovery or learning, the activity can be community-based and can be conducted within the context of a true partnership. It can have shared goals that link the mission university with the goals of the community participants as well as an agreed-upon definition of success that will be meaningful to the institution and the community. An engaged activity can also be supported by a pooling of resources across sectors of the campus as well as within the community. When these features are present, the resulting partnership is likely to be mutually beneficial and can build the capacity and competence of all parties. These relationships also create conditions for enriching the undergraduate experience.

There are a number of lessons to keep in mind when developing sustainable partnerships that can support discovery, learning and engagement in community settings. (Holland & Ramaley, 1998)As many of us have discovered, it is not easy to work in a collaborative way, but the rewards are well worth the effort. No other model affords the

same rich context for exercising the habits of good citizenship or for exposing our students to the realities of the complexity of a democratic way of life or for showing graphically that knowledge really can have consequences.

It is also true, however, that unless the institution as a whole embraces the value as well as the validity of engagement as legitimate scholarly work and provides both moral support and concrete financial resources to sustain this work, engagement will remain individually defined by the interests of committed faculty and sporadic in nature. Such limited interventions cannot influence larger systems on a scale necessary to address significant community issues. They also will not offer the stimulation and scope necessary to involve a significant proportion of the student body in meaningful public work. When embodied in the mission, values, structure, scholarly agenda and educational philosophy of an institution, the concept of engagement can be truly transformational. As the ACE/ Kellogg Project on Leadership and Institutional Transformation explains it (Eckel, 2002), transformation

- (1) alters the culture of the institution by changing select underlying assumptions and institutional behaviors, processes and products;
- (2) is deep and pervasive, affecting the whole institution;
- (3) is intentional, and
- (4) occurs consistently over time.

### **The Research University of the 21<sup>st</sup> Century**

Engagement can have significant consequences for how we interpret the mission and purposes of a research university.

- The primary purposes of the 21<sup>st</sup> century engaged university are to conduct research on important problems, ideas and questions, to promote the application of current knowledge to societal problems and to prepare its students to address these issues through a curriculum that emphasizes scholarly work in both the liberal arts and in the professions.

- Scholarly work consists of discovery, integration of new knowledge into an existing discipline or body of knowledge, interpretation to a variety of audiences and application of knowledge to a variety of contemporary questions. In a contemporary institution, all faculty, staff and students can and should engage in scholarly work, either

to address societal concerns or to strengthen the educational environment or to promote effective use of campus resources.

- The faculty, staff and students will participate in diverse forms of scholarly work at different times in their careers. No single profile can properly accommodate disciplinary differences and individual interests effectively. Sometimes this work will be in an engaged mode and sometimes it will not.

- The classic tripartite mission of research, instruction and service must support a full range of inquiry and application both within the curriculum and research environments created by the university and in field, community, and other applied settings. The University cannot and must not be insular. Scholarly work that involves instruction and research combined with service must be valued, rigorously reviewed and effectively rewarded.

- Although many institutions are oriented to address directly the social and economic problems of our society, the research university is distinguished by the comprehensiveness of its academic mission and its range of graduate and undergraduate programs and by the effective integration of scholarship and service within both the curriculum and the research mission, and by integral involvement of students in the generation and application of knowledge.
- Success in the university of the future will be defined by the rigor of scholarly work, by the quality of the educational experience of undergraduate and graduate and professional students, by the effectiveness of the partnerships that link the university with the community, and by the impact of the institution on the quality of life of citizens of the state, the nation and the world.

In summary:

Engaged scholarship calls for the academy to adopt new approaches to the discovery and application of knowledge that incorporate the ideas, values and expectations of the community as vital parts of the process that can influence the choice of questions to be addressed and decisions about who will participate in the work and help to interpret its meaning. For this mode to influence undergraduate education, we must welcome our students as full participants in all phases of scholarly work.

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