Collaborating with faculty on broader impacts portions of the NSF grant proposal process regarding K-12 outreach

Ms. Christine Newman, Johns Hopkins University

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Professional Preparation: Virginia Polytechnic and State University B.S. Mechanical Engineering 1989 Marshall University MBA 1995

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Synergistic Activities: Project Leadership Team for STEM Achievement in Baltimore Elementary Schools (SABES), an NSF Funded Math Science Partnership with Baltimore City Public Schools Grant No. DUE-1237992, 2012 – present. Co-Lead, STEM workgroup, Consortium for Urban Education, Baltimore, MD 2014-2015 Maryland State Department of Education STEM Equity workgroup 2014-2015 Professional Engineer, Commonwealth of Virginia, License No. 021864, 1996-2010 Board of Directors, Maryland Science Olympiad, 2010-present Champions Board, Mid Atlantic Girls Collaborative Network
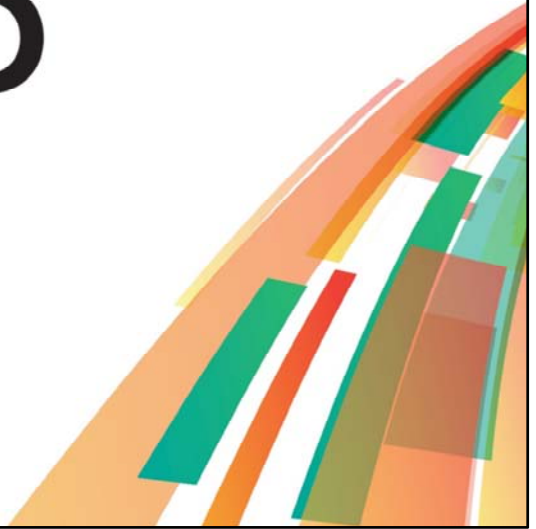
Good morning! My name is Christine Newman and I am the Assistant Dean leading the Center for Educational Outreach at Johns Hopkins University Whiting School of Engineering.

I'm here to share our successful practice of collaborating with engineering and science faculty to include K-12 outreach in their broader impacts grant proposals to the National Science Foundation (NSF).

The Center for Educational Outreach at Johns Hopkins University (an R1 University) has developed a successful process for collaborating with faculty who desire to do K-12 outreach as part of their NSF grant proposal's broader impacts section. Our goal is to share what works so that others may do the same at their own institutions.

We'll start by explaining our center's structure and mission.

Then we'll show you the variety of K-12 outreach options we offer our faculty.

We'll discuss how we communicate with faculty about this collaboration opportunity.

We'll explain how we "sell" faculty on the benefits of working with our center to include K-12 outreach in their grant proposals.

We'll share some of the processes we use to work with faculty during the actual grant proposal effort, the award, and the delivery of the outreach.

We'll also clarify what we think we still need to improve upon.

Outreach Center's Organizational Structure and Mission

- Reports to the School of Engineering Vice Dean of Undergraduate Education
- Vision – increase the number of underrepresented leaders pursuing STEM careers
- Mission – engage faculty and students to inspire and prepare K-12 students for STEM education and careers
- Strategy – focus on Baltimore City public school students while expanding our engineering summer program nationally

Our center sits in the Whiting School of Engineering which includes applied math and computer science as well as engineering. There are other STEM disciplines in the Krieger School of Arts and Science, but our primary goal is to work with the school of engineering faculty.

Initially we reported to the Vice Dean of Education. Then, more recently, that position was split into two roles—Vice Dean of Graduate Education and Vice Dean of Undergraduate Education. We report to the Vice Dean of Undergraduate Education.

As with any university, there is turnover and change. Since I started here in 2010, the Dean of the School of Engineering changed. Both the current and former Deans have been very supportive of our center. For example, we get credit for 100% of the tuition revenue from our high school summer program which allows us to offer free programming for Baltimore City students when grant funding is not available and allows us to continue/sustain local programs after grant funding ends.

I was asked to devise a vision, mission, and strategy for the center. Leveraging school district relationships, local engineering firm contacts, and diverse faculty, we developed a strategy and obtained buy-in. Narrowing the strategy to just one school district was questioned, but we suggested that once educational achievement gaps have improved in Baltimore City we could then reach out to the surrounding county.

Developing K-12 Infrastructure

Constant, intentional relationship building with City Schools Office of Teaching and Learning Science Department

Understanding City Schools' needs and delivering programming to meet those needs

Collaborating on NSF Math Science Partnership

Hiring former City Schools educators

Over 9 years the center has built relationships with the Teaching and Learning Office Science Department in Baltimore City Public Schools (City Schools).

Our center works hard to learn what City Schools' needs are and focuses our outreach efforts on those needs. For example, the annual Hopkins Robotics Cup came from a need identified by a science specialist in City Schools Central Office who wanted to grow the VEX robotics teams in middle and high schools by having a college site for the qualifying event.

We also worked very closely with City Schools' Teaching and Learning department and faculty from both our engineering and education schools to jointly write a proposal for a Math Science Partnership which developed elementary STEM teachers in school and out of school and engaged the community in STEM through mentoring, student-driven projects, and a STEM showcase. This resulted in an award for SABES— STEM Achievement in Baltimore Elementary Schools, which lasted 6 years and is being sustained by the partners beyond grant funding.

We've hired STEM educators who have had experience working in City Schools as our program managers. This helps with understanding how City Schools works and gives us credibility with teachers.

Likewise, City Schools has hired a curriculum writer on the SABES project from us.

The center has developed elementary, middle, and high school programming that include one day events and multi-day programs that serve students from City Schools during the school year and in the summer.

Our middle school teacher professional development opportunities include support for coaching VEX robotics or Science Olympiad teams.

Our elementary school teacher professional development opportunities include the SABES STEM Academies developed through the NSF MSP which are being continued by City Schools, the SABES out of school time (OST) facilitator training and coaching, and the Barclay Elementary Middle School Partnership science team meetings and coaching.

We also provide high school teachers the opportunity to learn engineering by co-teaching a college-level introduction to engineering course in the summer for which we provide training.

The menu we provide to faculty describes both the program and their or their grad student's or postdoc's time commitments, which they appreciate. They can select from a variety of grade levels so that they can work with an age group with whom they feel comfortable. Furthermore, some opportunities require no budget such as providing a special lecture to our summer engineering program students while others may require substantial funding such as a recent CAREER grant which started a new summer environmental program for elementary school students.

Communicating to Faculty

- New faculty orientations
- Leadership
- Peer organizations
- Faculty references
- Faculty updates at department meetings
- Graduate and postdoc organizations
- Website

The center has made a point of attending all new faculty orientations and introducing themselves as the center to contact if faculty want to do K-12 STEM outreach.

Vice Deans of Faculty and Research in the School of Engineering repetitively point faculty to the center when applying for grants.

The Center for Educational Resources works with faculty on program evaluation of REUs and IGERTs—they involve our center if K-12 outreach was proposed.

At this point, enough faculty have successfully collaborated with the center on K-12 outreach and have been awarded NSF grants, are telling other faculty about the center.

The center regularly visits department faculty meetings to share updates on the center's impact on K-12 students and involvement of faculty.

The center also speaks to graduate student and postdoc organizations to share outreach opportunities with them, presuming they obtain their faculty advisor's approval.

The center has a website with outreach options and information for faculty and students. None of these are fool proof methods—faculty don't read all the materials and not all faculty attend all department or school meetings.

Benefits to faculty for partnering with our center include:
Faculty do not have to re-invent the wheel because the center has already developed the infrastructure for K-12 outreach in City Schools.

Broader impacts K-12 outreach proposals will be more realistic and feasible because the center knows what to include in the budget and of our experienced K-12 outreach staff.

Proposals are attractive to NSF and make faculty feel they are making an impact because City Schools enrolls large percentages of both underserved and underrepresented students.

The center conducts outcome assessments, uses a data-driven process to continuously improve programs, and has a long-term view.

The center intends to sustain successful programming after grant funding ends. We do our best to build other revenue sources and work with our partners to find funding for programming that has been successful and that we want to have continue after the grant. Example—SABES Out-of-School-Time programming.

Additionally, the center records faculty and student participation and provides updates to the faculty on their impact on K-12 students and involvement of faculty and JHU students.

Our Center is upfront with faculty that they should expect some back-and-forth on this.
    We ask for advance notice of at least 4 weeks before a grant is due and 8 weeks or
    more if they want a City Schools letter or if developing new programming.

    Letters of collaboration from our center—we will not sign the very generic standard
    letter unless we've seen the proposed budget including the outreach and the
    broader impacts proposal so that we know what we are committing to.

    Our center writes a concise and NSF-attractive description of program for the
    proposal. Generally faculty don't have much space in their proposal for this but
    want to get across the impact it will have.

    Our center prepares reasonable budgets based upon programming and upon faculty
    time commitments. Our administrator has an NSF budget template that we fill out
    so that we get the correct IDC on the salary portion and put the "participant
    support costs" in the correct part of the budget. We recommend for K-12 outreach
    budgets:
        1-2% of total if leveraging existing programming infrastructure
        5-10% of total if developing new programming

Once awarded, our administrator works with the Principal Investigator's (PI's) administrator to set up separate internal accounts for "participant support costs" for K-12 outreach and salary for non-administrative functions of center staff (training mentors or conducting evaluations for example).

Our center manages compliance with our child safety policy including child safety training and fingerprinting and background checks.

Our center coordinates outreach scheduling based on both K-12 and lab schedules.

We check-in annually with the PI, or more frequently depending on the outreach plan and budget, if the outreach is not going as planned, or we are not seeing expenses against the internal accounts as expected.

Program evaluation—we'll conduct pre and post surveys or other evaluation methods as planned in proposal and share with faculty for their annual NSF reports.

Some departments don't utilize our center as much as others, so ongoing communication is necessary and direct, personal contact is helpful. We make a point of going to faculty department seminars, installations of chaired professorships, and faculty retreats because when faculty see us, they think of outreach they want to include in their proposals.

Some faculty think they can put the same budget in year after year. We often find out when they ask for us to sign the updated letter of collaboration—the day before the deadline. We ask to see the budget and let them know that it is out of date and provide an updated one. It may not make a difference that time, but hopefully they or their grant proposal administrator will remember to involve us earlier next time.

There is no easy process for checking on status of grant award. We keep an eye out for announcements about awards from the Dean, but sometimes we don't find out until a year into the grant when the faculty want to implement the broader impacts.

Some faculty simply prefer to do their own thing. All we can do is continue to communicate and explain the benefits.

Work Left to Do (Cont.)

- NSF Broader Impacts review panels still not consistently valuing broader impacts
  - "I don't think sponsors (including NSF) are demanding this level of sophistication since I still see funded research that includes outreach that is relatively uninformed (give presentations at science museums, give talks at local high schools and middle schools, tour kids through the labs) and is rarely evaluated with respect to its execution or impact."
  - "Actually, all my interactions with NSF seem to indicate that this part of a proposal simply needs to check a box—are broader impacts included in the proposal and are they reasonable. I've read many very good outreach sections (that seemingly were free since they didn't require funding), but I've never seen a proposal funded because of the professionalism of the outreach section."

NSF Broader Impacts review panels still are not consistently valuing broader impacts.

See the quotes from faculty above.

Some faculty believe that the outreach has to be innovative which discourages them from leveraging existing programming.

However, the most recent NSF proposal guidelines state, "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*."

The call for a MRSEC says, "The project activities *may be based on previously established and/or innovative methods and approaches, but in either case must be well justified*."

The next time NSF asks for public comment on the broader impacts of their grants, please encourage them to be more consistent in their review of the budget and proposed outreach—perhaps outreach experts should be reviewing that part of the proposal rather than experts in the field of the research (intellectual merit).