NSF Broader Impacts
The National Science Foundation has recently announced new criteria for its broader impact sections in grant applications. The agency appears to be moving away from unconnected Broader Impact (BI) projects led by individual PIs to more focused projects conducted through offices and/or programs that are already in place to handle multiple research and outreach endeavors.

The new criteria focus on the NSF goal of advancing scientific knowledge and activities “that contribute to the achievement of societally relevant outcomes”. The NSF has provided the following as examples of these outcomes:
• Enhanced participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (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.

In this context, our poster presents a summary of the activities hosted by the Center for Science Outreach at Vanderbilt University that offer multiple options for PIs to connect their research to the Nashville public and K-12 communities.

Vanderbilt University Center for Science Outreach
The Vanderbilt University Center for Science Outreach (CSO) has worked for over two decades to enhance the learning and teaching of science by creating innovative programs that connect scientists with the K-12 community and the public at large. Programs range from summer science camps for middle school students to family science nights to formal instruction in classrooms. The common thread in all of these activities is the involvement of scientists and “scientists in training” in working with educators at all levels to raise STEM literacy, and to excite students about pursuing STEM majors and careers. The CSO currently employs 20 full-time staff, including 12 Ph.D. scientists, who provide instructional and administrative support.

CSO partnerships
One of the strengths of the CSO is the development of partnerships with many businesses, universities, foundations, and organizations throughout the U.S. shown in the figure below.

School for Science and Math at Vanderbilt:
2007-present
The School for Science and Math at Vanderbilt (SSMV) is a joint venture between Vanderbilt University and Metropolitan Nashville Public Schools (MNPS) that offers high school students a four-year, interdisciplinary, research-centered learning experience. Students from grades 9-12 with 26 per grade attend the SSMV on the Vanderbilt campus one day per week, progressing from class-wide projects covering all STEM disciplines to individual research projects in university laboratories. Ph.D. scientists serve as full-time instructors. University faculty, postdocs, and graduate and undergraduate students participate as guest instructors and research mentors.

Interdisciplinary Science and Research Program: 2011-present
The Interdisciplinary Science and Research Program (ISR) is a joint venture between CSO scientists and MNPS K-12 schools. Working with MNPS teachers, scientists have developed a four-year, research-focused curriculum based on the SSMV model that has now been implemented in two high schools. Pre-ISR programs have been developed by scientist-teacher teams for grades 7-8. Vanderbilt faculty, postdocs and graduate students participate as guest instructors and research mentors.

Summer Science Camps for Middle School Students: 1998-present
One-week hands-on science camps for middle school girls and boys are held each summer on the Vanderbilt campus. For over 15 years these camps have provided hundreds of 7th and 8th graders with an enriching science experience. Staffed by scientists and teachers, the camps focus on interdisciplinary science activities designed to increase interest in and excitement about STEM disciplines. University faculty, postdocs, graduate and undergraduate students serve as volunteer presenters for the camps.

Research Experience for High School Students: 2006-present, and High School Teachers: 1998-present
Six-week summer research internships are offered annually for rising 12th grade and high school science teachers to work in a Vanderbilt laboratory through the Research Experience for High School Students (REHSS) and Research Experience for High School Teachers (REHST) programs. REHSS attracts outstanding student applicants from around the world, with up to 20 students accepted per year, while REHST attracts 2-5 teachers. Additional student support is provided through weekly sessions covering such topics as reading scientific journals, writing abstracts, and preparing scientific posters. Students present their work at a summer high school research symposium.

Scientist in the Classroom Partnership: 2000-present
The Scientist in the Classroom Partnership (SCP) program is beginning its 14th year in partnership with MNPS classrooms. Through this program, graduate students and postdocs are provided supplemental stipends to spend one day per week for one year co-teaching with a K-12 teacher. Over 120 scientists and 100 teachers have worked together in 33 schools throughout the district. Scientists gain important teaching and communication skills; teachers gain confidence in teaching science as well as science content, and K-12 students saw increased excitement about and achievement in science.

Family Science Nights: 2007-present
For the past six years, the CSO has worked with local schools and community organizations to host science nights for K-12 students and their families. Postdocs, graduate and undergraduate students from multiple universities volunteer to present hands-on activities that engage families of MNPS students Over 500 children and families participate each year.

Professional Development Workshops for K-12 Teachers: 1998-present
The CSO has worked with MNPS for almost 15 years to develop and implement innovative workshops for teachers. For example, current workshops focus on enhancing an understanding of science standards, how to integrate inquiry into the curriculum, and how to use and implement science kits through the MNPS Hands on Science program. The CSO and MNPS have recently entered into a unique expansion of this program with the development of a CSO working laboratory within the MNPS Professional Development building close to the campus.

CSO Program Impacts: Numbers of Participants

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<th>Program</th>
<th>Faculty</th>
<th>Postdocs, Grad - Undergrad Students</th>
<th>K-12 Students</th>
<th>K-12 Teachers</th>
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