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Federal Science, Technology, Engineering, and Math Education Inventory Highlighted

Today, OSTP Associate Director for Science Carl Wieman provided initial results from the most thorough inventory yet of Federal educational programs designed to boost teacher skills and student learning in science, engineering, technology, and mathematics (STEM). The inventory, compiled by OSTP, is one of a number of White House initiatives helping to fulfill President Obama's commitment to raise American students from the middle to the top of the pack in STEM subjects, and to better prepare today's students for 21st century jobs and careers.

Wieman, a leader of White House efforts in STEM education who has conducted extensive research on how students learn, presented the preliminary results today at "[STEM Smart: Lessons Learned From Successful Schools](#)," an all-day summit sponsored by the National Science Foundation (NSF) and held at Drexel University in Philadelphia. He has been a longtime proponent of making STEM education methods more evidence-based by capturing efficacy data from ongoing efforts and quickly applying those findings to classrooms for further refinement.

"We have many demonstrations of teaching practices that are much more effective than the conventional teaching methods and have been shown to work across many different fields of science and at many different institutions," said Wieman, a Nobel laureate in physics whose research has focused in part on how best to get students to learn physics. "These new teaching methods often double the amount students learn, and greatly reduce the numbers of students that fail or drop out of courses. We need our colleges and universities to immediately adopt these better teaching methods."

Noting that less is known about how to improve STEM teaching and learning in grades K – 12 compared to university classrooms, he applauded the recently released National Academies report "[Successful K-12 STEM Education](#)," which highlights advances in this arena and affirms the potential of further improvements if the Nation keeps its attention on the problem.

Just how much attention is already being paid to STEM education at every level becomes clear from the inventory conducted by OSTP, which involved a detailed accounting of all 13 Federal agencies that sponsor such programs. The OSTP inventory demanded more rigorous characterizations of those agencies' varied programs than previous efforts, resulting in a more trustworthy accounting and making possible more meaningful comparisons among programs. All told, the inventory tallied 252 specific programs in STEM education across the 13 agencies, representing a total Federal investment of \$3.5 billion. About \$1 billion of that is being spent to train individuals for activities specific to the mission of those funding agencies, including

National Institutes of Health training programs to help develop the next generation of biomedical researchers and US Department of Agriculture programs to train agricultural scientists.

The other \$2.5 billion is being applied to STEM education more generally. Among those programs are some that focus on gaining a better understanding of STEM learning itself at the K-12 and university levels through education research and development; programs to train STEM teachers; and programs that provide experiences for students that may pique their interest in STEM subjects and entice them into STEM classes and careers.

The inventory was conducted in partial fulfillment of requirements in the recently reauthorized America COMPETES Act, passage of which was spearheaded by Reps. Chaka Fattah (D-Pa.)—who attended today’s Philadelphia summit—and Frank Wolf (R-Va.), both of whom Wieman praised for their commitment to STEM education. Although the inventory was inspired in part by some concern in Congress that there may be redundancy and waste among the Nation’s STEM education programs, Wieman’s team found those fears to be unfounded.

“We have carried out an extensive analysis of all of these programs using a variety of simple and complicated methods, my favorite of which is the ‘hierarchical conglomerate clustering technique,’” Wieman said. “Perhaps somewhat surprisingly, we find that all of these 252 different programs are actually each doing quite unique things—each one is distinctly different from all 251 other programs.”

In fact, Wieman said, the Nation’s STEM education research portfolio today is, if anything, spread too thin across the vast teaching and learning landscape. He said a more strategic approach to determining research priorities could provide more meaningful results about what works and what doesn’t and, at the same time, allow limited resources to be redirected to “areas of STEM learning for which one might want programs but for which there is currently no Federal support.”

Complete results of the inventory and analysis, including methodological details, will be published this fall and will become part of a comprehensive Strategic STEM Education Plan for all Federal agencies, which OSTP is developing for delivery to Congress by January. That plan will look at how to strategically focus limited Federal dollars so they will have the highest possible impact in areas of national priority.

“We will be looking to ensure that all programs are designed according to what the evidence says works best,” Wieman said.

Meanwhile, Wieman noted, a number of non-Federal entities are contributing valuable momentum for change. He pointed in particular to a [major initiative](#) launched last week by the Association of American Universities (AAU), an association of most of the leading research universities in the country, which calls upon member institutions to implement a strenuous and detailed program of teaching reform. A recent [AAU “Discussion Draft”](#) concluded that dissatisfaction with their STEM teachers is a major reason why so many students switch out of STEM majors in the first two years of college. The analysis also takes universities to task for too often valuing research success over teaching skills when making faculty hiring decisions.

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