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# The Department of Energy National Laboratories are key to Closing America's STEM Skills Gap

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*Our nation needs a diverse, highly skilled Science, Technology, Engineering and Mathematics (STEM) workforce to remain globally competitive and meet the increasingly complex challenges of the twenty-first century. To ensure the future is made in all of America by all of America's workers, it is estimated that we will need to fill at least 3.4 million technical, well-paying jobs in the next two years alone.<sup>1</sup>*

*To create this future workforce, we must energize, excite, and engage all of America's students, especially those from populations historically underrepresented in STEM fields. The U.S. Department of Energy (DOE) and its 17 national laboratories – which employ over 57,000 researchers across the country<sup>2</sup> – should be a key component of this collective American endeavor. The imperative to develop the next generation of STEM-capable professionals is as acute, if not more so, within the labs as anywhere else in the economy. At the same time, with incredible researchers and world-class research facilities, the national laboratories are uniquely suited to inspire and engage teachers and the next generation of scientists and engineers to meet DOE missions.*

*The DOE national laboratories should expand programs that (1) engage teachers to amplify impact, (2) partner with locally relevant programs at the grassroots level, and (3) cultivate and leverage the passion of STEM professionals to expand experiential learning opportunities. Investments in these efforts would deliver extraordinary returns on our public investment in the next generation of STEM-capable Americans, especially those from low-income communities and communities of color.*

## **Recommendation #1: Expand teacher training programs at DOE to dramatically accelerate impact.**

In 2019, approximately 57 million students attended elementary and secondary school in the United States.<sup>3</sup> Many of these students aspire to STEM careers in areas like biomedical engineering or computer science, but ultimately lack the appropriate exposure, resources, and connections to explore these pathways further. Even with the national labs' large workforce of 57,000 researchers, it would be impossible to directly and effectively reach all of America's students. However, by focusing efforts on the continuous development and engagement of our nation's educators, they could reach an appreciable fraction of the 3.7 million educators instructing those students across the country.<sup>3</sup> DOE support of teacher training programs would help ensure STEM educator skills are continuously honed via real-world experiences.

The DOE Workforce Development for Teachers and Scientists (WDTS) programs have a wide array of Teacher Professional Development (TPD) practices and programs that could be expanded. These programs effectively engage teachers through Teacher-Scientist Partnership programs which pair scientists and engineers with teachers in the lab and the classroom. Teachers have the unique opportunity to directly engage with scientists and engineers in cutting-edge research that helps to solve real-world problems. Through these types of programs, just 2 researchers engaging only 12 teachers can reach over 3,000 students – amplifying the impact 100x.

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<sup>1</sup> U.S. National Academies of Science, Engineering, and Mathematics, "Labor Market Patterns and Trends" in *Building America's Skilled Technical Workforce* (Washington, DC: 2017), <https://www.nap.edu/read/23472/chapter/4>.

<sup>2</sup> U.S. Department of Energy, *Annual Report on the State of the DOE National Laboratories* (2017), <https://www.energy.gov/sites/prod/files/2017/02/f34/DOE%20State%20of%20the%20National%20Labs%20Report%2002132017.pdf>

<sup>3</sup> EducationData.org, "K-12 School Enrollment & Student Population Statistics," (accessed November 1, 2020), <https://educationdata.org/k12-enrollment-statistics/>

Our nation's teachers face enormous challenges, and DOE and its national laboratories have the talent, resources, and passion to support their success.

**Recommendation #2: Encourage the expansion of grassroots-level partnerships between national laboratories and federal and state education agencies.**

To inspire, engage, and retain a diverse community of students in STEM, it is imperative to reach students early and often. The responsibility for education at the K-12 level rightfully resides with the Department of Education, but teachers and administrators throughout our distributed system cannot do it alone. The resources of the DOE – not just funding, but facilities and people – as well as the National Science Foundation, NASA, and other federal science and technology agencies can and should be leveraged to enhance the impact of the Department of Education programs. The whole system must work together to meet the challenge ahead.

The national laboratories are doing this through strategic partnerships with the Department of Education and state-funded programs in states and regions. These partnerships have increased the number of underrepresented students pursuing post-secondary education. They also help to connect first-generation students and educators from low-income communities and communities of color with scientists and engineers to increase awareness and interest in STEM career opportunities. Many of these programs leverage state Department of Education data to engage students from populations traditionally underrepresented in STEM, simultaneously meeting both Department of Education and Department of Energy priorities. Numerous best practices can be expanded to reach more students. One state-level program alone engaged nearly 2500 students – of which 56.3% were underrepresented – across 53 schools and 20 districts, providing exposure to

STEM opportunities in their region. These programs are pioneering and represent a model for expansion across national laboratories.

**Recommendation #3: Provide formal programs and support for STEM professionals at the National Labs to serve as role models.**

The national laboratory complex employs tens of thousands of STEM professionals with both the expertise and the passion needed to engage students. However, most of these talented individuals have few formal program options for channeling their passion to inspire the next generation of the STEM workforce, especially within their work environments. Passionate individuals are often left to navigate a vast and at times confusing landscape of opportunities for STEM engagement. Federal programs are needed to encourage participation and reduce barriers to entry for students, teachers, *and* STEM professionals, so that everyone can join in this great American challenge.

One such program recruits national laboratory STEM professionals with diverse ethnicities, genders, and cultural backgrounds to serve as STEM ambassadors in regional communities, with a focus on low-income communities and communities of color. Participants are provided training and are connected to opportunities to hone their skills, share their passion with their communities, and energize the next generation of students. The program provides a way for the highly skilled workforces at national laboratories to creatively share their work, scientific discoveries, and passion for STEM. More broadly, the program is a model for effective STEM outreach and workforce development throughout the DOE complex.

By supporting programs that facilitate STEM engagement, DOE and its national laboratories can further increase the public's return on investment in the national laboratory system.