Testimony of Jeffrey Wadsworth, President and CEO
Battelle Memorial Institute
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Committee on Science and Technology
"Reform K-12 STEM Education"
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Good morning, Mr. Chairman and distinguished members of the Committee. My name is Jeff Wadsworth and I am President and Chief Executive Officer of Battelle Memorial Institute. I want to thank you for inviting me to speak today on this important topic and to join with the other witnesses this morning – several of whom I know and work with personally on education programs as you have heard in their testimonies.

To set some context, I will begin with a brief overview of the organization that I currently lead, and compare its mission with the role of this Committee. In the late 1920s, our founder Gordon Battelle established Battelle Memorial Institute through his will. Gordon Battelle was a visionary and part of a family of successful industrialists and humanitarians. He believed that scientific research was central to industrial competitiveness. Through his will, Battelle Memorial Institute was established with three founding purposes: (1) conduct scientific discovery, (2) translate discoveries into practical applications of benefit to the economy and to society, and (3) utilize the proceeds from these activities to benefit education of men and women for employment.

What began with several dozen people in Columbus, Ohio more than 80 years ago is today a global non-profit research and development enterprise with revenues of $5.6 billion. We employ more than 20,000 people and operate in many locations around the world. The majority of our staff work in more than 100 sites across the United States. In addition, Battelle operates seven national laboratories for the Department of Energy and the Department of Homeland Security, including: Oak Ridge National Laboratory (operated by UT-Battelle, in conjunction with the University of Tennessee), National Renewable Energy Laboratory (operated by the Alliance for Sustainable Energy), Pacific Northwest National Laboratory, Idaho National Laboratory (operated by Battelle Energy Alliance), Lawrence Livermore National Laboratory (operated by Lawrence Livermore National Security), and the National Biodefense Analysis and Countermeasures Center (operated by the Battelle National Biodefense Institute).

At Battelle, we have a first-hand understanding of the urgency addressed by the America COMPETES Act and we applaud the leadership in Congress and the White House on this issue. The talent available to replace the 40-plus-percent of Battelle scientists and engineers eligible to retire in the next few years is becoming increasingly scarce. A solid foundation in STEM education beginning in the K-12 years must become the rule – not the exception – for every student growing up in the United States.

The tie between education and economic development has never been more important than it is today – a view we share with this Committee. Although we have grown significantly over our history, the will of Gordon Battelle represents the constant guiding instrument for our

organization. The role of Battelle's management team is to continuously interpret the will in a contemporary context and constantly search for the best and highest use of our human capital and facilities.

Like many organizations with a high content of science and technology, we are strong advocates of STEM education and proud of our history of support to K-12, college, and workforce training programs. In 2001, we made a decision regarding the contemporary "best and highest use" of Battelle's financial resources and human talent in the area of education improvement. That decision ultimately led to integrating our education efforts in STEM as a full operating business of equal standing and priority to our core research and development businesses in Energy, Health and Life Sciences, National Security, and Laboratory Management. **We are aimed at STEM competency for all students, not just a select few.** In particular, we are joining with others in efforts to support students that are at high risk of being left behind due to any circumstance – their race, socioeconomic status, family situation – that reduces their chances of accessing a high quality education. Our efforts concentrate on K-12 STEM education, but as you will hear in my testimony, it is carried out through close partnerships with higher education leaders.

Battelle demonstrates one of the basic tenets of STEM collaboration espoused by experts in the field. Corporations are finding that their core competencies in logistics, communication and broadcasting, research and development, and information technology have tremendous value in the education sector. This is especially the case in STEM education because these organizations simultaneously provide authentic models of what STEM careers look like to students and teachers.

Battelle's core skills are in program management, public/private partnerships, systems engineering, and product design. These are coupled with our experience in management of multi-billion dollar assets such as U.S. National Laboratories that involve hundreds of simultaneous partnerships. We have translated this combination of competencies to the STEM education arena as we directly engage public education partners and like-minded corporations and foundations. I want to highlight for this Committee what we are learning along the way and offer some recommendations on ways the federal government can accelerate progress.

We are seeing high value in an approach that "uses STEM to create STEM." Metro Early College High School – described earlier by President Gordon Gee from The Ohio State University – is a good example of this principle at work. Metro uses project-based learning with STEM as the fundamental language for instruction. Art, history, composition, language, engineering, physics, mathematics are not separate disciplines. They are integrated into student-led projects as the core of learning in the school. A goal of project-based learning is to develop relevance. Relevance is actually quite easy to spot. It's when a student replaces the all too familiar: "W*hy would I ever need to know this?*" remark with, "*Oh… so that's how that works!*"

OSU and Battelle joined with 16 public school districts in central Ohio as founders of Metro. But for OSU and Battelle – with adjacent campuses that house the nation's largest land grant university and the world's largest independent research and development organization – creating a 400-student personalized learning STEM high school a mile away was not the sole objective.

The design goal was to establish Metro as an authentic demonstration laboratory with real students and teachers under real world conditions. OSU would co-construct Metro's curriculum with teachers and STEM practitioners at Battelle, and consequently transform the way OSU trained teachers from the outset. The school would be lottery based and non-selective. Mastery would be required in order to earn credit for each subject. Ohio-based KnowledgeWorks would provide support in school design, essential in the expansion of the Metro concept.

The fundamental design principle at Metro was the partnership itself. That is – we wanted to establish a school involving multiple public school districts, anchor higher education two-year and four-year institutions, and committed business that collectively commit to the design, start-up and continued governance of a school. Once established, the school would serve as a "platform" for proactively transferring learning and teaching practices to districts in its region and facilitate STEM education practices into those districts. Platform schools would be connected to other platform schools to amplify their impact.

As a demonstration school, Metro has met its objectives so far. Chosen by lottery without regard to their prior academic performance when they entered ninth grade, Metro's entire senior class will graduate and all have received admission to college. Not all will choose the traditional STEM studies in higher education – in fact, many will not. But all have a mastery of STEM fundamentals that will serve them well in whatever endeavors they choose. The operative word here is "choose" because all of their options remain open. Students' choices about college pursuits reveal their command of STEM. One student is interested in combining journalism and engineering studies because he wants to increase public understanding of technology and its implications. Another student is passionate about interior design and the application of sustainable products. These types of experiences are how new industries are born.

Our deep engagement at Metro led to scale – a statewide effort using similar design principles. Since opening in 2006, teachers and leaders at Metro also have helped to design and open 10 new STEM middle and high schools across Ohio and as far away as Richland, Washington. All are open to all students, of all abilities. Informed by experiences with Metro, Battelle worked with the Bill and Melinda Gates Foundation, The Ohio State University, and the State of Ohio to form the public/private Ohio STEM Learning Network. Battelle's education group manages this network with in-kind resources, and provides grants from the Gates Foundation and Battelle that are co-invested with regional funds. The network, called the OSLN (see www.osln.org), is a living laboratory of collaborative excellence. In less than three years, 10 STEM platform schools and 26 K-8 STEM programs of excellence have been created through this network. More than $100 million has been invested by public and private partners. The high schools now have 3,100 students; the K-8 programs reach more than 100,000 students district wide; and more than 1,000 teachers are involved.

Each school and program implementation is tailored to local, on-the-ground conditions. But all 36 schools and programs in Ohio, and the more than 300 partners that are at the core of the five regional "hub" collaborations (Akron, Cleveland, Cincinnati, Dayton, Columbus), have agreed to identical commitments regarding how they will participate with each other and their responsibility to actively share tools, practices, and human talent.

Educational systems are too strained to apply much focus and effort to effective collaboration. They are understandably focused on their own performance. We believe that careful network design and interface management are essential ingredients in scaling high quality education innovations. The basic formula for Battelle's network management is not a one-size-fits-all approach based on replication. While we are a highly disciplined organization in the way we apply design to solve engineering problems for our clients, our approach to managing networks of diverse partners is centered on relationship management and creating reciprocal value for the committed stakeholders. We place a deliberate focus on engineering the *interfaces among stakeholders* – across the K-12 to higher education continuum, and across education/industry/state government. This focus enables partnerships in various locations to leverage their strengths and maintain their distinctiveness, while benefiting from the work and progress of others operating in the network.

Statewide efforts are leading to multi-state efforts. A key to Battelle's success as a research and development organization is putting partnerships in place. We are applying these same skills to link schools and regions together in Ohio to accelerate STEM education innovation. **The natural extension is to link states together in a similar systematic fashion.** Battelle now is working with national organizations including the Bill and Melinda Gates Foundation and the National Governors Association to create multi-state networks. We currently are connecting networks across Ohio, Tennessee, North Carolina, and Washington, and adding other states and private corporations in this process. In all cases, we are building incentives for reciprocal agreements among states and regions. Committed collaboration is a requirement for participation.

Partnerships must be deeply engaged and not be cheerleaders from the sidelines. As I indicated earlier, STEM education is enhanced when industry and private partners engage their core skills with educators. In Cleveland for example, GE Lighting has converted one of the buildings on its Nela Park Campus to house a Cleveland Public STEM High School. GE employees work side-by-side with teachers and students without the need to leave the workplace. Students see professionals at work. Battelle is also organizing a community of practice with our national laboratory partners so they can tap into the state networks and amplify their education outreach efforts.

Advocates make the argument that STEM is a 21st century survival skill, but most programs pigeonhole STEM only where scientists and engineers work. *STEM does not take place just in laboratories – it can be found everywhere.* At Battelle, we are encouraging and funding STEM field sites and requiring connections of these sites to the regional schools that participate in the networks. In this context, a field site is a location where STEM experiences naturally occur. A good example is the Mid-Ohio Food Bank. Food distribution and hunger issues involve logistics and an understanding of data analytics. Students take on projects that are designed to improve the efficiency of food distribution, the use of community gardens, and new ways to increase local production. The direct application of STEM to social justice issues is a powerful motivator and offers relevance especially to students who come from poverty. Botany is taught inside a park conservatory and students learn about community gardens as a route to community self-reliance.

Data matters and information sharing matters even more. Ten years ago, while we were exploring the best and highest use of our own human talent, Battelle helped to launch a school support organization through a $10 million initiative called Battelle for Kids. Today, Battelle for Kids is a leading national provider of services related to value added assessment, data driven decision making and whole school reform. Battelle for Kids currently is working with 20 school districts across Appalachia Ohio on a comprehensive approach to connect college and career ready standards to teacher quality and school redesign. Broadening and deepening the access of students to high quality STEM teachers and educational experiences is an essential piece to the overall effort in Appalachia.

Despite many great examples of STEM initiatives and successes, there is little evidence they have had significant collective impact on STEM education nationwide. Indeed, there is plenty of evidence that suggests many of them are operating in isolation. Even the best teachers have few peers to call upon and little in terms of best practice and content that they can exploit for their students. The need for better instructional supports for teachers and students will only grow more acute as the states adopt fewer, higher, and clear world-class standards.

The reaction to this challenge is often seen as a logistical problem – create accessible databases, maps and inventories of programs and others will be able to more readily find solutions rather than having to reinvent them. The nation now has hundreds of databases of STEM initiatives that exist funded by states, federal agencies, and private sources. Most are useful, but almost instantly out-of-date at the moment of creation. The lists also are incomplete because they often don't capture work in process by grass roots innovators who don't have the time, awareness of such databases, or see value in contributing to these works. The information is also most useful to the "STEM-literate" – those who already understand STEM's value in a complete education. The "STEM-uninitiated" – the majority of educators and communities that are arguably the most in need – are not affected by these databases no matter how good.

Battelle provides solutions to some of the world's most important challenges. This work gives us the opportunity to connect with nearly a thousand government and private sector clients and partners each year, including some of the world's leading corporations and governmental agencies. Collaborative innovation is one of our strengths and it is embedded in our core values. Bringing educators and the key stakeholders that support education together with system developers and STEM professionals opens up entirely new and desperately needed innovations in the way we design, deliver and sustain education that makes a difference for all children and all communities. There are more than 200,000 scientists and engineers employed by the federal government. These STEM professionals are vital to both the economic and educational future of the nation. We must find better ways to connect and develop STEM talent across generations, geography and organizational boundaries. Such grand efforts always begin and end with collaboration and all of us need to work very hard to recognize and reward partnerships that make STEM education relevant and readily accessible.

In closing, I want to thank this Committee again for the opportunity to recap our perspectives about K-12 STEM education. As this Committee continues its important oversight of programs across the science and technology spectrum, we urge consideration of three important themes that I have underscored in my testimony: (1) provide incentives that create large-scale

partnerships, (2) base incentives on efforts that build systems that last beyond the lifetime of individual programs, and (3) require information sharing as a specific design criteria.

I would be pleased to answer any questions from the Committee. Thank you.

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