Written Testimony
of
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to the
Committee on Science, Space, and Technology
Research and Technology Subcommittee
on
"STEM and Computer Science: Preparing the 21st Century Workforce"
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Thank you for the opportunity to testify before the Committee and to offer our Coalition's views on the current state of science, technology, engineering, and mathematics education and the best federal policies to improve student outcomes in the STEM subjects.

As an alliance of more than 700 affiliated education, business, and professional organizations, the central mission of the STEM Education Coalition is to inform and guide federal and state policymakers on the critical role of STEM education.

In today's economy every American needs to have a strong foundation in STEM in order to succeed in virtually any job – from the shop floor to the research lab to the boardroom. Further, the best, highest-paying jobs of today are nearly all in the STEM fields. These jobs demand problem-solving, teamwork, creativity, and out- of -the -box thinking – all skills that are best cultivated through high quality learning opportunities in STEM. The steps we take to prepare our children now in STEM will have an enormous impact on the future of our economy, our national security, and America's continued leadership in science and technology.

Why STEM Matters

Our complex and changing world demands an adaptable workforce that is prepared to collaboratively reason through tough problems and come up with creative solutions to the challenges of tomorrow. STEM educational opportunities cultivate students' curiosity and creativity while teaching them to work as a team, base their reasoning on evidence, and solve problems through experimentation. Our students must gain the critical thinking abilities and other transferrable skills offered by STEM to be prepared for the unknown challenges and opportunities of our future

STEM education is closely linked with our nation's social and economic prosperity, and strong STEM skills are a central element of a well-rounded education. Why?

- At all levels of educational attainment, STEM job holders earn 11 percent higher wages compared to their same-degree counterparts in other jobs.[1]
- Half of all STEM jobs are available to workers without a four-year college degree, and these jobs pay $53,000 on average—a wage 10 percent higher than jobs with similar educational requirements.[2]
- 60 percent of U.S. employers are having difficulties finding qualified workers to fill vacancies at their companies. [3]
- While the U.S. economy grapples with economic recovery, job postings in in the STEM occupations outnumber unemployed workers by nearly two to one.[4]
- The top 10 bachelor-degree majors with the highest median earnings are all in STEM fields.[5]
- Almost all of the 30 fastest-growing occupations in the next decade will require at least some background in STEM.[6]
- Over the next 10 years, more than half (57%) of all manufacturing jobs will go unfilled because workers lack the skills needed to fill the positions[7]
- Although most parents of K–12 students (93 percent) believe that STEM education should be a priority in the U.S., only half (49 percent) agreed that it actually is a top priority for this country.[8]
- Only one in five STEM college students felt that their K–12 education prepared them extremely well for their college courses in STEM[9].
- Only 45 percent of U.S. high school graduates are ready for college work in math and 30 percent are ready in science.[10]
- Only one out of five households has access to and takes advantage of STEM-related after-school programming[11].
- Fewer than 40 percent of students who enter college intending to major in a STEM field complete a STEM degree.[12]

For all these reason, Congress must elevate STEM education as national policy priority as reflected through education reforms, policies to drive innovation, and budgetary priorities. More precisely, action by policymakers on STEM education should match the commonplace rhetoric about its importance.

States Are Making Important Decisions on STEM Education

The new federal K-12 education law, the Every Student Succeeds Act (ESSA) which was passed with broad bipartisan support in 2015 represents a fundamental shift in education policy with enormous implications for STEM education. This law will go into full effect over the next year and puts an array of key decisions affecting teaching and learning back into the hands of states and districts. Under ESSA schools are explicitly permitted to use federal dollars in a wide variety of new ways to support STEM activities.

In accordance with informal guidance issued under by the U.S. Department of Education in April, state and local education leaders can now support STEM activities with federal dollars in three main ways under the new ESSA framework:

- Increase students' equitable access to STEM courses and experiences, including out-of-school programs, STEM-themed schools, and career pathways;
- Support educators' knowledge and expertise in STEM disciplines through recruitment, preparation, support, and retention strategies; and
- Increase student access to materials and equipment needed to support inquiry-based pedagogy and active learning. [13]

It's worth mentioning that the guidance issued by the Trump Administration around allowable uses of federal funding to support STEM are nearly identical to similar guidance issued in 2016 by the Obama Administration, a sign of the recognition that STEM priorities are bipartisan and broadly shared.

In addition to these direct uses of federal funding provided to states and districts, states are permitted under ESSA to include student proficiency in science and other STEM-related subject areas in their state accountability systems. Meaning that student test scores in science can "count" in state accountability systems, broadening the focus of accountability dramatically from the narrow focus on math and reading that occurred during the No Child Left Behind era. Moreover, what we learned over the last 15 years is that if science doesn't "count", too many teachers will not choose or be allowed to teach science with their limited classroom time. Therefore, including science in state accountability can ensure this practice is not repeated.

These are the things that states *can* do under the new education law. What will they do?

If the first wave of state ESSA plans submitted to the Department of Education are a good indicator, the outlook is cautiously encouraging.

Our Coalition has collaborated with Education First and the Overdeck Foundation on an analysis of the 25 state ESSA plans that have either already been submitted (17 states) to the Department or that have published advanced drafts for public comment (8 other states)[14]. This analysis was published just last week has been covered since by Politico and by Education Week. Here are some highlights of what that analysis showed:

- **17 states are proposed to add student performance state science assessments to their state accountability systems.** This is a very important measure of STEM as a policy priority, since inclusion in accountability systems will influence a large number of "downstream" factors, such as instructional time, classroom resources, teacher recruitment plans, etc.
- **17 states (not the same 17 as with science) are adding career and technical education indicators to their accountability systems.** Similar to science, the inclusion of these measures will help link CTE coursework with college and career ready standards, will promote more rigorous CTE coursework, and will shed more light on economic and racial disparities in outcomes for CTE students, many of which end up in STEM careers.
- **19 states are adding Advanced Placement or International Baccalaureate indicators to their accountability systems.** AP/IB coursework is heavily focused on STEM subjects and is a very good mechanism for measuring how advanced coursework and highly trained teachers are distributed. Students taking advanced coursework are more likely to succeed in postsecondary education.
- **10 states are integrating STEM as priority for afterschool programs.** These states are requiring or encouraging federal funding for the ESSA's 21st Century Community Learning Centers program (Title II, Part B) to be focused on STEM-related activities and programs. These programs often reach a higher proportion of at-risk youth and have measurable impacts on the uptake of "employability" skills and student interest in STEM fields.
- **5 states will prioritize STEM in teacher professional development plans.** Federal funding under Title II of ESSA is a vital source of support for in-service teacher professional development and many states are proposing to use such funds to attract and retain STEM educators and to align curricula with workforce requirements.
- **5 states will also prioritize STEM as a core component of a "well-rounded" education.** One of the new funding streams under ESSA was the Title IV, Part A Student Success and Academic Enrichment Grants program, which will provide new flexible resources, mainly at the district level that can support a wide range of activities that contribute to a "well-rounded" education, including STEM activities, along with student health and safety, and classroom technology. This program is where the largest portion of new STEM activities included in ESSA reside.

The important conclusion of this analysis is that many states are responding to the economic and social signals they are receiving from parents, students, teachers, employers, and the global economic environment with an increased focus on STEM education, which was one of the main goals of the new education law.

However, Congress and the Trump Administration are sending mixed signals back to the states that are not making it easier for states to accomplish their STEM goals. The Trump Administration has proposed to entirely eliminate funding for many of the very ESSA programs that states are now proposing to utilize to support STEM education goals, including Title II.A Teacher Quality ($2 billion), Title IV, Part A "Well-Rounded" ($400 million), and Title IV, Part B Afterschool ($1.2 billion). Further, the House Appropriations Committee just last week advanced a FY 2018 bill for education programs that would also eliminate the $2 billion Title II professional development program, while adding $100 million for well-rounded education, and trimming almost $200 million out of the afterschool appropriation. Our Coalition strongly supports full funding for of these essential programs[15].

The major point we want to convey is that state and local policymakers need to see that there will be consistent and predictable federal funding levels provided for the federal programs they will depend on to support STEM education goals. We recognize that the federal budget process is chaotic and that we are faced with a large national deficit and mounting debt. However, state and district governments deal with the same realities and if we want them to prioritize STEM activities, they need to know that the federal government will be a reliable, supportive partner in those efforts.

While we have focused so far on the major role the Department of Education plays in administering more than $30 billion in federal funding for K-12 education, it is important to note that the National Science Foundation (NSF) and other federal science agencies have critical roles in aiding school, teachers, students in accomplishing national and state STEM goals, assessing outcomes, evaluating best practices, and in supporting specific STEM disciplines. The role of NSF in particular is becoming more important as the ways we learn about and choose careers change with rapid developments in technology.

Modern Career Notions Around STEM

Being a high-schooler today and contemplating decisions about college, career, and other forms of postsecondary education is daunting.

Colleges have become very expensive, with tuition and fees at public four-year colleges and universities growing 19 times faster than the median family income since 1980[16]. Student debt has grown to over $1.3 trillion[17]. Employees entering the workforce today can also expect to have many more jobs throughout their careers than their parents.

STEM careers are changing rapidly as well. As the global economy becomes more technological, more jobs require STEM skills across the spectrum from the board room to the factory floor – and especially so-called "middle skills" jobs that are important in advanced manufacturing and the service industries. Further, as technology has become more commonplace, so has data and data-driven decision making. These trends are now being explored in depth across the American workforce and are understood by almost every modern business.

However, parents, teachers, and students – and the education system in general – are struggling to keep up.

As an example, the Brookings Institution published a great study a few years ago documenting that roughly half of the jobs in the STEM fields do not require a four-year college degree[18]. This finding is very much at odds with the perceptions of parents in public opinion surveys, where recent studies have shown that large numbers of parents do not think "science is for their kids" or that "the average American doesn't need science skills."[19]

There are similar trends at work with teachers and students, where a variety of misperceptions exist about careers in STEM fields, salaries for those STEM careers, and the prospects for people from diverse backgrounds in STEM fields.

A lot of kids and parents are not aware that STEM-skilled technicians – the people who repair airplanes, medical devices, modern cars, or maintain security for IT systems – make as much or more as many college degrees and many times enjoy greater job satisfaction and lower rates of unemployment[20].

These disturbing trends are due, at least in part, to longstanding imagery of scientists doing their work in white lab coats. And the images of scientists and engineers conjured in the minds of many are mostly white and male. These public images matter in career decision making at every level.

The National Science Foundation plays a powerful role in fueling our knowledge base around these issues. NSF programs have traditionally expanded our understanding of trends in STEM careers and in the education of students and teachers to join those careers.

NSF needs the resources to make sustained investments in understanding how to cultivate more STEM talent from communities of color and how to overcome barriers to the participation of women and minorities in STEM fields. NSF also needs to help educators understand how best to use technology in their classrooms and integrate experiential learning and student use of the internet.

NSF must also continue to focus on discovering better ways to educate new teachers with core STEM skills – and how to support those teachers in our poorest and most challenging school environments.

We certainly appreciate the Committee's support for helping to provide NSF with the legislative authority to address these challenges. The STEM Education Act of 2015 helped to expand the definition of "STEM" fields to include computer science – a needed modernization and to help improve the Noyce Scholarship program for STEM teachers by making it more accessible to prospective teachers seeking a graduate degree. We also appreciate the Committee's work earlier in the year to pass legislation signed into law by President Trump to promote NSF efforts to bring more women and girls into the STEM fields[21].

I know my other colleagues on the panel will provide more details around computer science, but we certainly share the belief that computer science has emerged as an essential skill in many, many modern career paths. Our Coalition has long-supported an inclusive definition and use of the term "STEM education" by federal and state programs that is not practically limited to only math and science, but also embraces engineering and technology and their related disciplines, including computer science, data analytics, statistics, and other related computing fields.

Afterschool, Informal Learning, and STEM Education

At the same time technology and globalism is rapidly changing the American workforce, the ways in which students learn and become familiar with their career choices are changing at an equally frenetic pace.

One significant trend is the STEM education community's enthusiastic embrace of informal education programs as a mechanism for improving educational outcomes. If we want to employ an "all hands on deck" approach to improve STEM, we must fully utilize the opportunities presented by out-school, informal, and afterschool learning environments. Emerging research is demonstrating very clearly that out-of-school STEM programs contribute to both academic and social measures of student success.

A major study published in *Science* in 2006 found that "professed interest in STEM careers by eighth grade was a more accurate predictor of getting a science-related college degree than were the math or science test scores of those same eighth-grade students."[22]

More than a decade of increasingly comprehensive studies have reinforced the notion that informal learning can make concrete, measurable contributions to student success, not only in the classroom environment, but in broader measures of youth development, maturity, and career success.

A study of the U.S. Department of Education's 21st Century Community Learning Centers program, the only federal funding source exclusively dedicated to afterschool programs, showed that participating students had fewer absences and less tardiness, higher grades, higher rates of homework completion, and increased rates of parental involvement in school[23].

After a 15-month review of the current evidence base, the National Research Council's (NRC) Board on Science Education concluded in a recent 2015 study that out-of-school programs have been shown to:

- contribute to young people's interest in and understanding of STEM,
- connect young people to caring adults who serve as role models, and
- reduce the achievement gap between young people from low-income and high income families.[24]

The beneficial aspects of informal and out-of-school STEM programming have certainly been noticed by the private sector, where a wide range of companies are increasing their philanthropic focus on STEM generally and on informal opportunities in particular, including afterschool STEM programming, STEM-related competitions, student "real world" experiences, and similar opportunities to provide young minds with high-quality meaningful experiences in STEM[25].

In this area, the STEM Education Act of 2015 is also helpful, as it reaffirmed the important role of the NSF in pioneering research into how informal and classroom-based learning methods can be most effectively integrated and best employed. Federal policies that seize on afterschool programs and their unique role in inspiring interest and success in STEM education will engage more young people in the STEM fields so important to the future of our country.

Closing

A dozen years ago, one of our Coalition's main goals was to get Congress to recognize that improvements in STEM education had to be thought of as being just as important to the future of the country as investments in basic research and development. The 2007 passage of the America COMPETES Act, other bipartisan legislation from this Committee, the initiatives of two prior Presidential administrations of different parties, and the 2015 passage of the Every Student Succeeds Act have all served to elevate STEM education as a national priority. However, the challenge has really only begun as countless school districts, principals and teachers across the country are now searching for solutions to the myriad of daily challenges inherent in making STEM a functional daily priority. We see the proper federal role in this

environment as providing our schools with the proper resources, tools, and supports – both political and financial - to successfully rise to that challenge.

We appreciate the chance to offer our views and pledge to work with the Committee and your colleagues in Congress achieve these common goals.

Thank you.

STEM Education Coalition Leadership Council Members

www.stemedcoalition.org

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