



Building STEM Education Back Better

Recommendations to President-Elect Joe Biden and the Transition Team

November 2020

The STEM Education Coalition is an alliance of more than 800 education, business, and professional organizations. We appreciate the opportunity to share our views and recommendations as you formulate your Administration and plans for national recovery from COVID-19 and a return to a prosperous and equitable future.

Our nation's future success is directly tied to excellence in science, technology, engineering, mathematics, and computer science education (the STEM fields). Advancing STEM must be a central element of a broad-based Build It Back Better agenda to promote U.S. prosperity and innovation in an increasingly competitive, technology-driven world.

***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.***

Over the course of the past year, enormous gaps in educational attainment and equity and have become visible and been exacerbated by our response to COVID and its impacts on the education system, especially for our youngest and most at-risk students. Reopening our schools safely must be a priority to get the country back on its feet and headed towards a future where every child will have a chance to learn the skills they need to succeed in the modern world – which are overwhelmingly in the STEM fields.

Excellence in STEM should be embraced as a bedrock element in conquering the challenges of today and tomorrow, including improving health, competing for the best jobs of the future, modernizing our infrastructure, protecting our environment and fostering equity for those who have been underserved by our systems. American recovery from COVID and its economic disruptions demands having a world-class education system that broadens authentic participation in STEM to all communities of learners. If we work together, our nation can do just that.

As a Coalition, we share the following broad principles:

- **STEM Education is Not a Luxury, STEM Education is a Necessity:** Unfortunately, during the COVID pandemic, far too many schools have turned away from a strong focus on the STEM subjects as they have struggled to maintain their operations with insufficient federal support. We need to reverse this trend before a generation of students falls behind in the knowledge and skills they will need to support our recovery, achieve equity, and propel us forward. In addition to increasing federal support for STEM Education, we recommend the federal government provide support for research into developing best practices and resources to support distance learning in STEM in K-12 and higher education.
- **Full Funding and Support for STEM education programs in the Every Student Succeeds Act (ESSA):** The Biden Administration should propose full funding for the STEM-related programs outlined in the bipartisan and broadly supported Every Student Succeeds Act, which will empower states and districts to make key decisions about their own STEM priorities.
- **Equity and Access in the STEM Pipeline:** We must expand the capacity and diversity of the STEM workforce pipeline and prepare more students for the best jobs of the future by working to raise achievement in the STEM fields for all K-12 students – and beginning in the early grades both inside and outside the classroom. We should leave no part of America behind and must close the digital divide. We must also invest in efforts to broaden participation in our higher education STEM ecosystem to build a strong and equitable future. America’s global competitiveness and national security depend on a strong STEM research enterprise and workforce, which will be strengthened by broadening participation.
- **Bipartisan and Broad-based Policies:** Policies to promote STEM education as a national priority have been and should remain bipartisan and evidence-based. Such policies will be supported by a strong and united community of stakeholders and advocates in the business, professional, research, and education communities.
- **A Strong Workforce Focus:** Work with business and industry leaders to identify key workforce issues and use federal resources to empower state and local education leaders and their communities with the resources they need to promote STEM as a priority and to drive change.
- **Inter- Agency Collaboration:** A STEM agenda must embody an “all hands on deck” approach to improving STEM that integrates workforce, K-12, higher-education, career and technical, informal and out-of-school learning, and research elements and effectively leverages resources across the federal government. Many agencies play important roles in STEM education including the Department of Education, National Science Foundation, Department of Defense, and National Aeronautics and Space Administration.

- **Embracing Innovation:** Embrace emerging trends and best practices in STEM education such as hands-on STEM competitions, integration of classroom strategies with informal learning outside the classroom, state of the art educational technologies, and project-based learning. We need to ensure teachers and schools are fully supported to do this.
- **Fostering Public-Private Partnerships:** Work with stakeholders to promote public-private partnerships, and effective business and industry engagement strategies in STEM education.
- **Stakeholder Engagement:** The federal government is best able to support the STEM Education ecosystem when actively engaging with a broad set of stakeholders and listening to the needs and perspectives of those with direct expertise.

We Respectfully Submit the Following 100-day Recommendations to the Biden Administration

Organizing and Staffing the Administration's STEM Education Response

- Appoint a STEM coordinator at the White House Office of Science and Technology Policy (OSTP) whose role will be to drive a STEM education, workforce, and jobs agenda across the federal government.
- Reestablish the Office of STEM Education at the Department of Education and ensure it is adequately staffed.
- Ensure that the Federal Committee on STEM Education, charged with interagency coordination, is fully staffed and supported to be effective in its Congressionally mandated functions.
- Appoint qualified STEM education professionals to a wider range of federal advisory bodies, such as the President's Council of Advisors on Science and Technology and the National Science Board, and in White House and other senior federal agency policymaking positions.
- Make STEM education programs and resources designed by federal agencies (e.g. NASA, DOE, NOAA, DOT, EPA) more accessible and aligned to the Framework for K–12 Science Education and related standards. Additionally, leverage the reach of major Federally Funded Research and Development Centers, such as the National Laboratories.
- Reinstate the White House Science/STEM Fair and hold public events that excite the public about STEM and demonstrate to the Nation that STEM is an Administration priority.

STEM Education and Budget Priorities

We urge you to prioritize funding for federal programs that are essential to student success in STEM subjects in your first budget:

- We support the successful implementation of the *Every Student Succeeds Act* (ESSA) and its key STEM provisions:
 - *Student Support and Academic Enrichment Grants* (ESSA Title IV.A), which is the major STEM funding source for states and districts under ESSA.
 - *Education Innovation and Research* program (ESSA Title IV.F), which has awarded more than half of its competitive grants in the past year to support STEM-related projects.
 - *Supporting Effective Instruction Grants* (ESSA Title II.A), which funds professional development for STEM educators.

21st Century Community Learning Centers (ESSA Title IV.B), which funds high-quality STEM programming in afterschool and summer learning programs.
- Include science assessments for federal accountability on par with assessments for Mathematics and English Language Arts when ESSA is reauthorized. Emphasize the value and importance of science education, especially elementary science, both of which have seen a marked decline in classrooms over the last four years as a result of the narrowing of the curriculum caused by No Child Left Behind.
- Consider restoring federal programs and funding that directly benefit STEM education, such as the Title IIB Math-Science Partnership Program when ESSA is reauthorized
- Establish a pilot program for the rapid recruitment, training, and retention of diverse teachers and administrators to leadership positions in STEM instruction.
- We support funding for *The Strengthening Career and Technical Education for the 21st Century Act* (Perkins) which also has a significant STEM focus.
- We support the National Science Foundation's Education and Human Resources (EHR) Directorate. The EHR directorate plays a critical role in expanding the STEM education knowledge base for broadened participation, graduate and undergraduate innovation and fellowships, enabling a skilled technical workforce, informal and afterschool education, and student experiences in STEM careers. NSF additionally funds student STEM training, education research, and community engagement in STEM through its

research directorates. We support creating pathways for scaling and implementing NSF-funded education research through better partnerships with the Department of Education.

- We support establishing a more transparent process for expanding or modifying the Department of Homeland Security list of STEM-designated degree programs that would provide a clear pathway for adding emerging and/or proven STEM disciplines to DHS-listed STEM fields for immigration purposes, thus enhancing the pipeline of much-needed STEM students and professionals.

Adopt the Recommendations of the National Academies Board on Science Education’s Study on COVID and Its Impacts on Schools

The NAS Board on Science Education has provided states and districts with guidance about whether and how to safely reopen schools in the 2020-2021 school year. The study ([Reopening Schools During the COVID-19 Pandemic](#)) drew on evidence from epidemiology, public health, and the social and behavioral sciences. The report provided guidance on the health-related issues for safely reopening schools and the practices that should be implemented in order to maintain and monitor the health of staff and students. We urge you to utilize this resource as you formulate your COVID response and its application to K-12 schools.

Empower the Federal STEM Education Strategic Plan to Succeed

In 2018, the Trump Administration published a 5-year strategic plan, [Charting a Course for Success: America’s Strategy for STEM Education](#). This plan, which was developed with input from STEM stakeholders, proposed a wide range of policies to improving STEM education, bolster the competitiveness of the American workforce, and expanding opportunities to empower all Americans with the skills to succeed in the modern global economy. The Biden Administration can deliver on the promise of these plans by reflecting STEM education goals in its future agency-by-agency budget proposals and implementation plans and by delivering on its commitments to establish STEM education as core priority at the Department of Education, the National Science Foundation, and throughout the mission agencies. We urge the Biden Administration to seek robust stakeholder input and embrace transparency during development of future iterations of these plans.

Infrastructure Plans Must Include Resources to Support STEM Education

The Administration’s plans to improve the nation’s infrastructure must address STEM education-related needs, including school laboratories and facilities, broadband access and digital resources to support modern learning, school equipment and instructional materials and logistics and transportation to enable hands-on learning and research infrastructure to support development of the future STEM workforce. See Addendum at the end of this document outlining specific STEM infrastructure priorities.

12 Reasons Why STEM Education is Important for Building It Back Better

- More than half of STEM educators our Coalition surveyed this Fall report that science and engineering instruction has become less of a focus as a result of the coronavirus pandemic.
- As of the fall 2020 semester, nearly 75% of STEM educators report that instruction has shifted to mostly virtual or some form of hybrid remote/in-person model as a result of the coronavirus pandemic.
- Early data shows that the coronavirus pandemic has resulted in a big drop in math skills and significant learning gaps to fill, especially for predominately low-income Black and Hispanic students, who experienced access barriers to remote learning environments. ([According to the NWEA](#))
- Between 2017 and 2027, the number of STEM jobs will grow 13 percent, compared to 9 percent for non-STEM jobs—with positions in computing, engineering, and advanced manufacturing leading the way. (Via the [Education Commission of the States](#))
- Overall, since 1990, employment in STEM occupations has grown 79%—increasing from 9.7 million to 17.3 million. (Via a 2018 article from [Pew Research Center](#))
- The median annual wage of STEM occupations in 2019 was \$86,980. This is well over double of that of non-STEM occupations, where the median annual wage came in at \$38,160. (Via the [Bureau of Labor Statistics](#))
- The US placed 38th of 71 countries in math, and 24th in science. This is according to the Programme for International Student Assessment (PISA)—which is regarded as one of the biggest cross-national tests of its kind. (Via the [Pew Research Center](#); Pew also published [these 7 facts about the STEM workforce](#) on 1/9/18)
- US universities are expected to produce only 29% of the required number of grads to fill the 1.4 million computer specialist job openings projected to be available in 2020. (Projected by the [US Department of Labor](#))
- 74% of middle school girls express an interest in engineering, science, and math. But only 0.4% choose computer science as a major when they get to college. (Reported by [girlswhocode.org](#) and mentioned by the [National Girls Collaborative Project](#))
- In the 2019 STEM survey by Emerson, it was stated that 2 of 3 women said they weren't encouraged to pursue a STEM career. (From [Emerson.com](#))
- 40% of black students switch out of STEM majors before earning a degree. This is according to a study published in the journal, Education Researcher, and highlighted by the [Education Advisory Board](#).
- *Black workers make up 11% of the U.S. workforce but represent 9% of STEM workers. This is in addition to Hispanics, who make up 16% of the workforce, but only 7% of all STEM workers. And, of those employed adults who hold a bachelor's degree or higher, 7% are black workers and 6% are Hispanic workers of the STEM workforce." (via [Pew Research Center](#))*

Addendum - Infrastructure and STEM Education- What Does That Encompass?

Any vision to improve and expand STEM education must encompass an infrastructure strategy that supports the ability for all educators and students to become STEM literate and to enable students to become: capable information technology users; analyzers and evaluators; problem solvers and decision makers; creative and effective users of productivity tools; communicators, collaborators, publishers, and producers; and informed, responsible, and contributing citizens.

Physical Facilities and Improvements

Adequate physical facilities are vital to supporting a successful STEM learning environment. There are several aspects of physical facilities that require investment to develop and maintain effective STEM programming. This includes investing in:

- Classrooms, buildings, school grounds, and libraries, as well as investments for physical facilities to support out of school STEM activities and project-based learning such as science centers and museums, community centers, public libraries, and afterschool facilities.
- Laboratories, including science, computer, and engineering labs;
- Supplies/tools, including microscopes, beakers, calculators, safety tools, and other equipment to support hands-on STEM activities;
- Textbooks, lab manuals, and other materials to support guided STEM activities leveraging tools and physical infrastructure designed for STEM learning.

Technology and Distance Learning

The emergence of technology in education represents a major challenge and opportunity to address the infrastructure needs of a successful STEM learning environment. Aspects of technology that require attention and investment include:

- Developing and utilizing online learning/distance learning technologies to integrate with similar on-campus STEM activities to better assimilate technology and to give opportunities for students to learn in a digital environment, particularly for students in rural areas that lack accessibility to traditional STEM learning opportunities;
- Securing the universal availability of high-speed internet connectivity, both in and out of school, and an internet-based platform to support STEM on-going activities and digital instruction accessible for educators and students;

- Computers, other audio/visual equipment to support technology-based STEM education;
- Curriculum that incorporates an effective technology-based education leveraging the tools and facilities provided through investment.

STEM Ecosystems

A robust STEM education infrastructure plan should include a strategic approach to develop an “ecosystem” of additional aspects that contribute to the technology and physical facility needs to ensure a well-rounded, high-quality STEM learning environment. Additional aspects to develop a high-quality STEM ecosystem include:

- Educators and their professional development to support effective STEM education that leverages the physical facilities and tools available and contributes to developing a dynamic STEM curriculum;
- Partnerships (community-based/public-private) for out-of-school activities, hands-on learning, apprenticeships, additional equipment and facilities;
- Transportation to support STEM education opportunities out-of-school;
- Other tools and supplies needed to ensure an equitable STEM learning environment for traditionally underserved populations and students with disabilities;
- Support staff, including administrative and information technology to ensure a secure and healthy atmosphere for STEM and digital-based learning.