

Ensuring All Americans Have Lifelong Access to High-Quality STEM Education through Afterschool, Out-of-School, and Summer STEM Learning

The release of the nation's 5-year STEM education strategy in December 2018 provides the federal government with an opportunity to reinvest, reimagine, and reprioritize science, technology, engineering, and mathematics (STEM) education for students, in the context of a shared goal to ensure all Americans have lifelong access to high-quality STEM education. Federal agencies implementing this 5-year strategy through their STEM-education and science-engagement initiatives and programs can take advantage of this moment to find new ways to engage more Americans, both youth and adults, in STEM subjects and careers. The Afterschool STEM Hub — supported by a collaboration of afterschool, summer, and informal STEM education leaders, stakeholders, and researchers — offers here an initial response to the call to action for non-federal stakeholders to partner with each other and the federal government towards achieving the goals of the plan.

Afterschool programs address equity by reaching high-needs populations

An aspirational goal of the 5-year STEM education strategy reflects a desire to increase diversity, equity, and inclusion in STEM by providing all Americans with access to high-quality STEM education, particularly those historically underserved and underrepresented in STEM fields. Hundreds of millions of Americans visit out-of-school learning institutions and participate in informal STEM education programs annually.^{1,2} These programs and institutions are located in diverse communities all across the country — communities small and large, urban and rural. Afterschool programs, thanks to current public investments, overwhelmingly serve young people from low-income and racially marginalized communities and can therefore play a key role in tackling diversity issues in STEM employment sectors.³

Afterschool and summer programs are an effective avenue for reaching the demographics often targeted by efforts to broaden participation in STEM fields. These programs serve students from low-income and underserved communities with proven results, from increased school-day attendance to higher rates of interest in STEM subjects and careers.^{4,5} Nevertheless, for every student in an afterschool program (10.2 million in 2014), there are two awaiting access. In rural communities, the number awaiting access increases to three, showing that demand for afterschool opportunities is high across the nation. 70 percent of parents whose children are enrolled in afterschool programs report that their kids have access to STEM learning through their afterschool program, meaning afterschool STEM experiences are reaching around 7 million kids; but the unmet demand for afterschool STEM experiences is more than twice that number.⁶

Effective STEM learning ecosystems require exchange between formal and informal educators

Many educational institutions play a role in STEM engagement and learning for students, including schools, afterschool and summer learning programs, museums and science centers, libraries, higher education institutions, and other community organizations. With students spending 80 percent of their time outside of school, it is imperative that efforts to broaden access to high-quality STEM learning include opportunities to scale successful afterschool and summer programs. Already, out-of-school and informal STEM learning organizations are leading and collaborating in STEM learning ecosystems in communities across the nation. In addition to providing afterschool and summer programs for youth, STEM organizations are also hosting an estimated 13 million students or more annually through school

field trips, and also working closely with formal education systems by offering workshops and demonstrations for teachers and students, school outreach programs, professional development for teachers, curriculum materials, and programs for home schoolers.²

The implementation of the Administration's 5-year STEM education strategy, *Charting a Course for STEM Success: America's Strategy for STEM Education*, provides an opportunity to recognize and elevate the role of afterschool and summer learning programs, and informal learning institutions, as key components of STEM education ecosystems.

Afterschool programs engage youth in computer science learning

It is critical that high-quality opportunities for developing computer science skills and computational literacy are available to all students. Currently, the majority of schools do not offer a rigorous computer science (CS) course (40 percent offer computer programming/coding), but a majority (67 percent) *do* offer CS through informal clubs and afterschool programs.⁷ Additionally, informal STEM learning institutions are increasing computational literacy among Americans of all ages through a wide variety of learning approaches that include augmented reality, virtual reality, and other environments with embedded technology. The importance of including afterschool and summer programs, and informal STEM learning institutions, in investments to increase and sustain access to computing education for all students, while also supporting curriculum, professional development, and policies that support CS learning, cannot be overstated.

A recent survey of afterschool programs found that 59 percent of respondents currently offer, or have offered in the past, CS opportunities to their participants. Among afterschool programs that have not offered CS opportunities in the past, 52 percent would like to. For those programs not currently offering CS but interested in doing so, the top three challenges were related to professional development, funding, and curriculum availability.⁸

Afterschool programs help build foundational skills and spark interest in STEM careers

For more than a decade, employers have reported that communication, teamwork, collaboration, critical thinking, and problem solving are among the most important skills for their workforce, but are difficult to find in potential and current employees.⁹ Afterschool programs and other informal STEM learning opportunities provide a ladder of supports that help students reach their career aspirations. Many informal learning spaces across the country, such as science centers and museums, offer sustained skills development and pathways to STEM careers through youth enrichment-to-employment programs that serve students in their time outside the classroom.

Additionally, afterschool programs serving younger students often work with students on their communication and teamwork skills, the foundational skills employers desire in their future hires. The flexible nature of afterschool programs also lend themselves to expose students to the wide spectrum of career fields, from introducing students to a potential new interest to taking students on field trips to local businesses to learn more about that field. STEM interest, identity, and understanding are all fostered and reinforced in afterschool settings, making afterschool programs a critical tool of any learning ecosystem.¹⁰

How agencies can support afterschool STEM opportunities

Explicitly name afterschool and summer learning programs, and informal STEM learning institutions, as eligible applicants and partners for federal grants and other solicitations that support STEM-education and science-engagement goals. The administration's 5-year STEM strategy calls for ecosystems of STEM learning that blend proven practices across formal and informal learning for students. Providing more opportunities for afterschool and summer programs, and informal

STEM learning institutions, to partner and collaborate on federal initiatives would help to expand the number of opportunities young people and adults have to high-quality STEM learning opportunities, while providing additional insight and data to the research base of informal STEM programs.

Recognize the importance of professional development and technical assistance by investing greater resources in training and support for, and by, a wide range of educators supporting STEM learning. Classroom teachers, alongside afterschool and summer educators, should engage in joint professional development opportunities, increasing the quality of the STEM activities and instruction provided to students.¹¹ Today, informal STEM learning institutions are already developing and refining curriculum and leading teacher professional development programs for classroom teachers, on behalf of local schools. Additionally, as computer-science and data-science education continues to expand into afterschool and summer programs and informal STEM learning institutions, professional development opportunities in this area should be open to educators working in afterschool or summer programs, and curriculum designs should accommodate implementation across formal and informal learning spaces, both in- and out-of-school. Agencies can support transdisciplinary and cross-sector professional development by explicitly including informal STEM educators among their target populations to be served and their eligible institutions to lead professional development for STEM educators, as well as through non-regulatory guidance and technical assistance activities for grantees.

Invest in an ambitious afterschool and summer STEM research agenda. We need to better understand and document how STEM learning occurs across diverse settings and over time for a wide range of people in order to promote productive strategies that support afterschool and summer STEM learning. The following types of studies can be used to inform STEM-education and science-engagement investments across the federal government and foster interagency collaborations in the afterschool STEM programming portfolio.

- Research that helps us understand how different approaches to afterschool and summer STEM learning may lead to different STEM learning outcomes. This could involve qualitative studies that document characteristics of STEM programs, including aspects such as STEM content, teaching strategies employed, partnerships with other members of the STEM community, measurement tools used, and more.
- Large-scale longitudinal studies with comparison groups to track children who have participated in afterschool STEM programs. Carefully designed studies can document if and how participation in afterschool STEM programs affects students' lifelong engagement with STEM, academic pathways in STEM, or career pathways in STEM.

The Afterschool STEM Hub, with its deep connections to educational researchers, can help to connect federal agencies to experts interested in assisting with these efforts.

About the Afterschool STEM Hub

The Afterschool STEM Hub is a collaboration among a diverse set of national education leaders and stakeholders, who are experts in learning, engagement, evaluation, and impact, and support cross-sector partnerships at the national, state, and local level. Connect with us for ideas, program examples, and research: stemhub@afterschoolalliance.org.

STEM Hub Membership

Afterschool Alliance
Association of Science-Technology Centers
Boys & Girls Clubs of America
Every Hour Counts
ExpandEd Schools
Girls Inc.
National Network of Statewide Afterschool Networks
National AfterSchool Association
National 4-H Council
National Girls Collaborative
National Summer Learning Association
Oregon ASK
Techbridge Girls
Vermont Afterschool
YMCA of the USA

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