Preparing all children to meet the challenges of tomorrow by expanding access to K-12 computer science education through out-of-school time programs

A statement from the Afterschool STEM Hub, a collaboration of national afterschool and summer learning leaders and stakeholders.

Afterschool and summer learning programs are essential to states, districts, and communities seeking to support and expand K-12 computer science education. When used strategically, these programs provide a pathway of learning opportunities across the grade-span, spark interest and deepen engagement, and connect students what they learn during the school day. As computer science is, and will continue to be, a driver of innovation and economic growth,[1] it is essential that all students have access to an education in foundational computing skills. Afterschool programs serve 10.2 million kids across the U.S.,[2] and offer a tremendous opportunity to reach more kids with computer science.

THE LEARNING ECOSYSTEM

In thinking about science, technology, engineering, and math (STEM) education, many educational institutions play a role in student engagement and learning, including schools, afterschool, and summer learning programs, museums and science centers, libraries, higher education institutions, and other community organizations. The same is true for computer science education—youth can gain exposure, knowledge, and skills at any or all of these institutions. Further, learning STEM is like becoming fluent in another language: all children need multiple, varied, and early learning opportunities to achieve mastery.[3,4] This is especially important when beginning computational thinking skills in the elementary grades and presenting youth with wide range of computer-related pursuits and application areas. Schools cannot and should not have to do it alone.

WHAT AFTERSCHOOL PROVIDES

To spark engagement, youth must experience STEM content—including computer science content—as relevant, interesting, and enjoyable, while also seeing themselves and being seen by others as accomplished learners.[5,6] Interest, identity, and understanding are all fostered and reinforced in out-of-school time settings.[7] Interest breeds interest, and students who participate in afterschool and summer STEM programs seek more opportunities to engage, sparking life-long curiosity and persistence in the STEM fields.[8,9] Fueled by enthusiastic educators, and grounded in youth development principles such as student leadership, civic engagement, and positive adult relationships, out-of-school time programs are an essential component of strong K-12 computer science learning ecosystems.

REACHING TARGETED POPULATIONS

Afterschool programs serve proportionally higher numbers of young people from low-income and racially marginalized communities,[10] and can therefore play a key role in reaching the demographics often targeted by efforts to broaden participation in computer science. Combined with approaches intended to be engaging and responsive to young people's needs and interests, afterschool and summer learning programs can be particularly powerful in ensuring that diverse groups of youth experience positive personal and educational outcomes.[11]

As stated in the 2016 K-12 Computer Science Framework, "informal education organizations are essential to the computer science education ecosystem and should be included as critical stakeholders in state and district implementation efforts."[12] The specific policy and programmatic recommendations that follow will help reach more students with computer science education, while building bridges between schools and out-of-school time organizations.

Recommendations

1

Include afterschool and summer learning as key components in state plans for K-12 computer science; and include experts in out-of-school time education in the planning, decision-making, and implementation of such efforts.

Formal state plans for K-12 computer science education bring coordination and coherence to the myriad stakeholders involved in supporting high quality, accessible computer science learning for all students. By making an inclusive and intentional plan for reinforcing policies, implementation strategies, resources, expectations, and the targeting of underrepresented and under resourced populations, states can garner the support, expertise, and participation of critical stakeholders, including out-of-school time providers.

a. **Partner on state standards:** State computer science education plans that identify rigorous standards and associated resources for K-12 computing should recognize informal learning providers as stakeholders and partners. While afterschool and summer learning programs would not directly implement standards, they can work closely with district and school partners to design programming that complements school day objectives and supports targeted student populations.

b. **Educate decision-making staff:** As state and local education associations prioritize STEM and computer science education with dedicated staff positions, those staff should be familiar with the value and structure of the afterschool and summer learning field. Furthermore, they should seek opportunities to work with informal learning stakeholders, such as the federally-funded 21st Century Community Learning Center offices and staff within the state's Department of Education; or museums and other STEM-rich institutions to ensure that high-quality computer science opportunities and resources are incorporated into the implementation of afterschool and summer learning programs.

c. **Include afterschool experts:** States and district leaders should appoint afterschool and informal STEM and computer science education experts to a wide range of government advisory bodies, including school district and governors' initiatives, to elevate the role of these learning spaces in the larger computer science and STEM learning ecosystem. Federal entities, such as the President's Council of Advisors on Science and Technology, the Committee on Science, Technology, Engineering, and Math Education (CoSTEM), the National Science Board, and other federal agency policymaking bodies should do the same. Any working groups should also include voices from the afterschool and summer learning field.

Recommendations (continued)

2

Leverage innovative professional development and curriculum initiatives to support afterschool computer science educators.

Many afterschool programs are interested in offering computing experiences for their students, but need for professional development and curriculum tailored for out-of-school time environment to do so.[13] Computer science professional development opportunities should be open to educators working in afterschool or summer programs, and curriculum designs should accommodate implementation across all learning spaces, both in- and out-of-school. Professional development and curricula resources should incorporate culturally responsive approaches and address implicit biases.

a. **Leverage federal statutes:** For example, the Higher Education Act, the Carl D. Perkins Career and Technical Education Act, and the Every Student Succeeds Act can support computer science professional development opportunities and resource development for both formal and informal educators.

b. **Engage pre-service teachers:** As institutions of higher education develop their preservice computer science teacher preparation programs, they should allow for internship placements and practicum experience in afterschool and summer programs. Educator programs can make use of informal education spaces to serve as low-risk sites for teacher training, where prospective teachers can work with children in open-ended and nonjudgmental contexts.

c. **Computer science education experts** can design research-based professional development models, curricula, and evaluation tools designed for the afterschool environment.

d. **Researchers in computer science education** can engage afterschool and summer learning programs, staff, and / or volunteers as partners in their federally-funded research projects in support of broader impacts.

e. **Industry partners and grant makers** can support training for employee volunteers and fund partnerships between technology sector industries, informal STEM organizations (e.g., science museums), and afterschool programs to expand computer science expertise for the afterschool field.

Recommendations (continued)

3

Pursue collective impact strategies that leverage public and private investments, in order to increase the availability of and resources for high-quality afterschool computer science.

Among parents and guardians, demand for afterschool programs outstrips availability by two to one—meaning that the parents of 20 million children would enroll their child in an afterschool program if one where available and affordable to them.[14] Expanding access to afterschool programs in general, is a crucial step that exists in parallel to growing supports for quality computer science education in out-of-school time. A cross-sector approach is required to provide all students with equitable access and build their interest in the computing fields. Public and private efforts can be coordinated to maximize investments and increase the level of funding for programs and for program supports such as professional development, curricula, and evaluation tools.

a. **Make afterschool programs** eligible partners for federal and state grants that support STEM education goals, and ensure that STEM initiatives include computer science. Use public investments to set the stage for leveraging and growing private funds.

b. **Fully fund federal programs** that support STEM and computer science learning and related resources, such as Title II, Part A, and Title IV, Parts A and B, of the Every Student Succeeds Act. These programs allow states and local districts to provide students the well-rounded education they need to be engaged and successful, and to prioritize STEM and computer science programs and teacher training. Increases in funding for both the 21st Century Community Learning Centers initiative (a dedicated funding stream for afterschool programs within the Every Student Succeeds Act) and the Child Care Development Block Grant will increase the number of low-income, school-age children regularly participating in federally-assisted afterschool and summer learning programs and begin to narrow the opportunity gap.

c. **Design programs** and initiatives to link out-of-school and school day computer science learning. For example, Title IV, Part A of the Every Student Succeeds Act supports opportunities for hands-on STEM learning, increasing and improving computing instruction, integrating informal and formal STEM programs, and increasing the number of STEM specialty schools.

d. **Solicit input** from afterschool and summer program experts and other informal STEM education stakeholders when establishing federal agency priorities in computer science education. Federal agencies should invest in an ambitious out-of-school time computer science research agenda that includes large-scale longitudinal studies that track children who have participated in out-of-school time computing programs and document if and how participation in informal computer science programs affects students' lifelong engagement with computer science and related academic and career pathways. Continuing to develop evaluation tools and understanding best methods for supporting the implementation of integrated evaluation practices in afterschool programs will lead to increased program performance and student learning outcomes.

About the Afterschool STEM Hub

The Afterschool STEM Hub is a collaboration among a diverse set of national education leaders and stakeholders, working to ensure the important place of afterschool and summer learning programs in the STEM learning ecosystem. It includes representation from national afterschool providers, education researchers, informal science organizations, and STEM policy influencers. Further, the Afterschool STEM Hub, and its individual members, are experts in learning and engagement, and support cross-sector partnerships at the national, state, and local level. For questions, please contact stemhub@afterschoolalliance.org.

MEMBERS INCLUDE:

Afterschool Alliance
Association of Science-Technology Centers
Boys & Girls Clubs of America
Cornell Lab of Ornithology
Every Hour Counts
ExpandED Schools
Girls Inc.
National 4-H Council
National AfterSchool Association
National Girls Collaborative
National Network of Statewide Afterschool Networks
National Summer Learning Association
OregonASK
The PEAR Institute: Partnerships in Education and Resilience
Research + Practice Collaboratory
Robert Tai, University of Virginia
STEM Education Coalition
STEM Next
Techbridge Girls
Vermont Afterschool, Inc.
YMCA of the USA

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