Frontiers in Urban Science Exploration

Resource Guide

Second Edition | February 2014

Strategies to advance informal STEM education in expanded learning settings

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“One of the things that I’ve been focused on as President is how we create an all-hands-on-deck approach to science, technology, engineering, and math. We’ve got to do everything we can to make sure that we are giving these young people opportunity to pursue their studies and discover new ways of doing things... After all, the science fair projects of today could become the products and businesses of tomorrow.”

President Barack Obama
Third Annual White House Science Fair, 2013

Introduction

Young people today lack exposure to abundant science learning experiences and are missing opportunities to connect to the science fields. Math and reading remain the central focus of most public schools, often at the expense of science and social studies. According to a recent report from National Public Radio, nearly one-quarter of parents with children in grades K-12 feel that the schools their children attend don't put enough emphasis on science curricula.[1] And in schools that do incorporate science learning, students often don't get the chance to see how science relates to their own lives or career prospects, or to develop a deep understanding of scientific thinking and problem-solving.

The result of all this is that students feel disengaged from science. And it shows. The latest data from the Programme in International Student Assessment (PISA) place U.S. students 28th globally in science proficiency, with low-income and minority youth lagging the furthest behind.[2] This has profound implications for their ability to compete in the increasingly globalized, high-tech workforce of the 21st century.

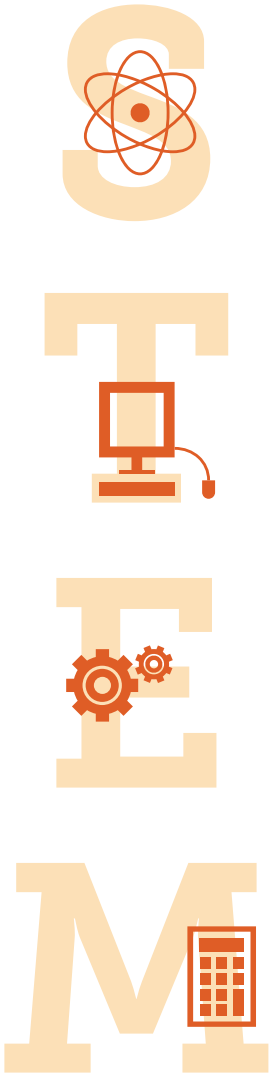
Expanded learning opportunities (after-school, summer, and extended-day programs) offer an ideal setting to engage students in science—and more broadly, STEM (science, technology, engineering, and math)—through hands-on, inquiry-based learning. Students are more interested in learning about science when they have a stake in it—when they have to get their sailboat to move faster, or code a website that they can show off to their friends and parents. Expanded learning opportunities enable students to engage in exactly this kind of project-based learning. Compared to the school day, these programs' less formal environments, longer time blocks, and more personalized instruction give students the chance to visit science museums, explore local gardens, perform laboratory experiments, or otherwise spark their love of discovery. They also build students' 21st-century skills, such as problem-solving and teamwork.

Although expanded learning opportunities and STEM education fit well together, high-quality informal science education is not

yet happening at scale. A 2012 report on the condition of STEM learning in the U.S. found that only 19 percent of households with children in grades K-12 have children enrolled in out-of-school time STEM programs.[3] Local programs and national after-school initiatives have made strides toward expanding the availability of informal STEM learning opportunities, but, until recently, these efforts were not systematized to ensure a consistent level of high quality or to reach significant numbers of youth.

In 2010, in an effort to institutionalize engaging, inquiry-based, informal STEM education, TASC joined with Every Hour Counts (formerly the Collaborative for Building After-School Systems) to launch Frontiers in Urban Science Exploration (FUSE). This national initiative, generously supported by the Noyce Foundation, built off an effort that TASC led in New York City from 2007–2010. The goal was to stimulate a culture shift among after-school leaders and staff to increase the demand for and capacity to deliver high-quality informal STEM education.

FUSE communities employ a two-fold approach. They implement a "grass-tops" strategy to engage leaders and staff of schools and expanded-learning programs, government officials, science organizations, policymakers, and funders in awareness-raising activities and to build enthusiasm and capacity for inquiry-based STEM learning in expanded learning settings. And they pursue a "grass-roots" strategy to provide frontline staff and supervisors with the content knowledge and instructional skills needed to deliver high-quality informal STEM education.



[1] National Public Radio. (2013). "To Make Science Real, Kids Want More Fun." Retrieved 12/20/13 from http://www.npr.org/2013/12/17/251675532/to-make-science-real-kids-want-more-fun-and-fewer-facts.

[2] The Guardian. (2013). "PISA 2012 Results: Which country does best at reading, maths, and science?" Retrieved 12/20/13 from http://www.theguardian.com/news/datablog/2013/dec/03/pisa-results-country-best-reading-maths-science.

[3] Change the Equation. (2012). "Vital Signs: Reports on the condition of STEM learning in the U.S." Retrieved 12/20/13 from http://changetheequation.org/lost-opportunity.

Grounded in the experiences of our partners over the past three years, Every Hour Counts developed this resource guide to profile promising strategies that advance informal STEM learning.

The guide features:

+ Core elements of high-quality informal STEM education.
+ Overview of the Every Hour Counts FUSE national demonstration, profiles of promising city- and county-wide initiatives, and lessons learned in working to bring informal STEM education to scale.
+ Curriculum resources to advance informal STEM learning.
+ Strategies to inform the development of comprehensive evaluation plans that assess the impact of STEM education in informal settings.
+ Funding sources and partnerships to support the continued growth and long-term sustainability of informal STEM education programs.
+ A look ahead at what's next for the informal STEM education field.
+ A reference list of resources to help support the development of inquiry-based STEM learning opportunities in expanded learning settings.

Core Elements of High-Quality Informal STEM Education

High-quality informal STEM education strategies are designed to be flexible enough to be effective across jurisdictions yet focused enough to result in similar, shared impact. These strategies build on local assets, while maintaining broad core elements to support program success. Core elements of informal STEM programs can be described at the youth, program, and system levels.

- Youth-level elements describe outcomes the FUSE strategy intends to achieve.
- Program-level elements describe characteristics of high-quality informal STEM programming.
- System-level elements describe characteristics of well-coordinated systems that lead to improved quality, scale, and sustainability.

Youth-Level Elements

Youth Impact

The goals for youth impact are holistic. They focus on whether inquiry-based informal STEM learning experiences cultivate students' STEM interest and keep them engaged in learning. Key indicators include:

- Student motivation
- Student confidence
- Student knowledge

Program-Level Elements

High-Quality Curricula

Programs integrate curricula that:

- Are designed for expanded learning programs
- Are inquiry-based
- Are grounded in fun
- Offer youth opportunities to engage in project- or service-based learning
- Involve familiar materials and real-world contexts to make the case that science is part of our everyday lives
- Allow for youth-driven exploration but offer exposure to new experiences and concepts
- Promote equity across race and ethnicity, between boys and girls, and among students of varying abilities
- Build skills that relate to and create awareness of STEM careers

Intentional Design

Programs are part of a long-term strategy to advance STEM learning. They:

- Articulate specific learning goals and outcomes
- Complement students' experiences in the core instructional day
- Schedule and sequence activities in a purposeful way to affect learning outcomes
- Make use of regular assessment to inform a continuous process of program quality improvement

Co-Inquiry

Staff and students explore and test assumptions side by side.

Relationships

Programs foster positive relationships, promoting collaboration among students and offering youth opportunities to interact with adults in caring relationships. They also encourage students to make connections to their families and communities through their STEM learning experiences.

System-Level Elements

Grass-Tops and Grass-Roots Approach

A two-fold approach engages both leaders (grass-tops) and frontline staff (grass-roots) to promote the expectation of and capacity to deliver high-quality informal STEM education in expanded learning settings.

Deep and Intensive Professional Development

To ensure continuity of skills and expertise from year to year, training and technical assistance are:

- Ongoing: conducted in multiple sessions across the year with ongoing observation and individual coaching
- Differentiated: incorporate advanced activities to ensure skill progression for returning participants
- Cohort-based: involve multiple sites trained as a group, such as in a learning community
- Delivered to teams: attended by both supervisors and frontline staff from the same site to minimize loss of training expertise with staff attrition and support multi-level, team-based training

Use of a Coordinating Organization

An intermediary or coordinating body supports the development of the informal STEM education strategy by:

- Leveraging resources
- Vetting curricula
- Organizing trainings
- Fostering partnerships and collaborations
- Evaluating impact and quality
- Disseminating promising practices

FUSE National Strategy

The Frontiers in Urban Science Exploration (FUSE) initiative was originally launched by The After-School Corporation (TASC) in New York City in 2007. Following TASC's successful demonstration of the model over a three-year period, and with the generous support of the Noyce Foundation, FUSE was adopted for a national demonstration by Every Hour Counts (formerly the Collaborative for Building After-School Systems), beginning in Providence, RI, and Oakland, CA, and later expanding to Baltimore, Boston, Chicago, and Palm Beach County, FL. The initiative was implemented in these jurisdictions through grant funding and technical assistance provided to local intermediary organizations. FUSE strategies in these seven communities have reached approximately 1,500 community educators and more than 32,000 students.

In alignment with a vision for informal STEM education in expanded learning programs, Every Hour Counts established the following goals for the FUSE National Expansion initiative:

Depth

To change attitudes and beliefs among frontline staff, educators, informal STEM education experts, and policymakers that after-school staff can be supported and trained to facilitate inquiry-based science learning experiences, and to provide professional development to support that.

Sustainability

To ensure the commitment of local and national stakeholders to the delivery of inquiry-based informal STEM education in expanded learning programs over the long-term, and to identify and secure sufficient and reliable streams of resources to support delivery in multiple jurisdictions.

Spread

To increase delivery of high-quality, inquiry-based informal STEM education in school and community-based settings in multiple jurisdictions across the country.

The FUSE model employs a two-fold approach: a "grass-tops" component to engage city leaders, funders, and other stakeholders in supporting STEM systems, and a "grass-roots" component to increase the interest and confidence of the after-school workforce in delivering STEM learning activities. Grass-tops activities include partnerships with school districts and other STEM organizations, leadership councils, and STEM advisory networks; grassroots activities focus on professional development, including group trainings, e-learning communities, and one-on-one coaching.

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Promising STEM Models

With the national scale-up of FUSE, a number of local strategies to advance STEM education through expanded learning programs have been taking shape. Intermediaries have built on existing after-school infrastructure, such as partnerships with city governments and school districts, and piloted new efforts, such as online professional development, to support the infusion of high-quality informal STEM education in expanded learning settings. Here we highlight promising practices at the grass-tops and grass-roots levels from across FUSE communities.

Grass-tops: Building Partnerships

Partnerships with City Government

New York City has had strong city support for out-of-school time (OST), especially after 2005, when a dedicated funding stream for OST was established within the Department of Youth and Community Development (DYCD). The city's OST initiative is the nation's largest municipally funded after-school system; dedicated funding in 2013 totaled nearly $120 million.[4]

DYCD has often looked to The After-School Corporation (TASC) as a leader in out-of-school time. In 2012, amid increased local and national interest in STEM and prompted by TASC's FUSE work, the agency added a requirement to its Request for Proposals from OST programs that they include at least two hours per week of STEM programming and/or reading/literacy instruction. It also put out a competitive bid to select a group that would offer OST providers technical assistance around STEM instruction; following a successful application, the contract was awarded to TASC.

In the first year of the DYCD contract, TASC provided opportunities for site leaders and

[4] New York City Department of Youth and Community Development. (2013). "DYCD 2012-2013 Annual Report." Retrieved 12/20/13 from www1.nyc.gov/html/dycd/html/about/annual.shtml

frontline staff to learn about STEM, reaching more than 500 participants from 90 agencies, who attended orientation and planning sessions, curriculum trainings, or peer networks. STEM 101, targeting site directors, coordinators, and education specialists, focused on defining STEM in after-school, allowing participants to experience an inquiry-based activity, refine their understanding of STEM practices, and reflect on the readiness of their program to implement STEM. A second session, STEM 201, helped participants further reflect and plan for the coming year. Peer networks engaged site leaders in topics such as the Next Generation Science Standards and family engagement, and curriculum trainings familiarized frontline staff with high-quality curricula.

Through its partnership with DYCD, TASC has been able to expand the FUSE model of STEM instruction more widely across New York City. In pursuing this breadth, however, the depth of trainings is necessarily limited; following every group-training with individual observation and coaching is next to impossible. Therefore, TASC trainers have had to think strategically about where to conduct observation visits and how to better employ a train-the-trainer or train-the-coach model at sites the agency supports.

Partnerships with School Districts and Higher Education

Providence After School Alliance (PASA) began cultivating and deepening local partnerships to support informal STEM education in 2010. These partnerships have been instrumental to sustaining STEM work in expanded learning settings in Providence beyond the duration of the grant. PASA worked closely with the Providence Public School District (PPSD) to enroll district students in its AfterZone (school-year) and Summer Scholars STEM programming, and to engage district teachers in collaborative planning and teaching efforts with community educators. The two entities also partnered to redesign the school day with a focus on STEM at a turn-around middle school. As a result of its positive experiences in supporting informal STEM learning with PASA, the district has committed to investing close to $400,000 in PASA's Summer Scholars program, and is investigating opportunities to apply for and leverage federal Career and Technical Education funds.

In addition, PASA developed a strong relationship with Rhode Island College (RIC), which graduates approximately 80 percent of the state's teachers. Teachers-in-training at RIC's Feinstein School of Education and Human Development served as AmeriCorps service members leading STEM activities in the AfterZone. PASA and the RIC STEM Center also co-hosted a conference for after-school program providers on STEM learning, inquiry, and effective youth development practice. This collaboration led to high retention among the AmeriCorps members. PASA and the RIC STEM Center are currently exploring ways to sustain and deepen their partnership, including a joint application for a National Science Foundation grant.

Partnerships with Statewide STEM Leaders

Boston is home to one of seven regional STEM networks in Massachusetts that participate in the Governor's STEM Advisory Council, created by executive order of Governor Deval Patrick in 2009 to ensure that all students are educated in STEM fields and can pursue related post-secondary degrees or careers. Boston After School

& Beyond, a FUSE grantee, serves as co-chair of the Boston STEM Network's OST Task Force, together with the United Way of Massachusetts Bay and Merrimack Valley. Serving in this role connected Boston Beyond to a variety of policymakers and funders, giving its leaders a platform to advocate for out-of-school time as a strategic opportunity for STEM programming. It also positioned Boston Beyond as a leader in the field: by convening STEM businesses, the school district, and community members at meetings and conferences on informal science education, the organization brought together key STEM stakeholders to discuss national and local approaches to hands-on science education, share best practices, and develop partnerships to strengthen student interest and achievement in STEM.

Partnerships with Citywide STEM Leaders

In Chicago, a leadership team of stakeholders convened a number of groups from across the city's youth development and STEM community to assess the landscape of OST STEM programming and develop a strategy for expanding youth pathways into STEM education and careers. The group collected data on the location and content of OST STEM programs; on student participation by grade level, gender, and race; and on the barriers students faced in accessing programming. Though findings indicated that opportunities were abundant and available in nearly all Chicago neighborhoods, there was no overarching citywide strategy connecting youth to STEM pathways.

In December 2012, a group of over 200 STEM education stakeholders and practitioners convened in Chicago to review the preliminary findings and develop recommendations for a comprehensive citywide STEM pathways strategy. The final report presenting the findings of the landscape scan and a roadmap for implementing the citywide strategy was published in summer 2013 and will inform the approach to systematizing informal STEM education going forward.

Grass-roots: Building Instructor and Program Quality

Online Professional Development

While FUSE cities have continued to focus on in-person group trainings to help frontline staff build inquiry-based instructional skills, create meaningful interdisciplinary lesson plans, and develop strategies for lesson facilitation, many of them have also begun adding online learning components as they expand scale and seek to offer more flexible and ongoing opportunities for professional development. Two models that are gaining traction are online learning modules and e-learning communities. Additionally, organizations like Techbridge and University of Nebraska-Lincoln are developing online platforms that can assist with professional development nationwide.

Prime Time Palm Beach County, FL:

Prime Time Palm Beach County has launched a "Fun Facts" STEM quiz to assess staff knowledge about STEM and an online interactive teaching module to guide them on the 5 E's (Engage, Explore, Explain, Extend, Evaluate) instructional method. This module walks the practitioner through his

or her role during each phase, breaking down the key items. Staff can access the module from anywhere, anytime, and move through it at their own pace; at the end they complete an interactive matching quiz to check for understanding.

Following launch and implementation of the 5 E's module, Prime Time surveyed practitioners on professional development topics of interest, and is now in the process of developing a second module on co-inquiry in after-school STEM.

After School Matters, Chicago:

In Chicago, After School Matters (ASM) has focused its online efforts on a virtual professional learning community for informal educators. The site was initially launched for STEM instructors and now serves instructors across all content areas. Hosted on a Google platform, it serves as a clearinghouse for information on best practices in instruction, curriculum and lesson planning, incorporation of college and career readiness, and ASM program highlights. The site is also meant to foster peer-to-peer knowledge sharing. A notable feature is the series of "learning playlists" curated by instructors. Using a platform developed by Mentor Mob, these playlists offer articles, slides, video, sample lesson plans, activities, and other input from frontline staff focused on an instructional strategy or content area—for example, integrating hip-hop culture and aesthetics into literacy programming. The goal of the learning playlists is to provide ASM instructors with opportunities to document and share their expertise with one another.

ASM's online learning community launched at the beginning of 2013. Challenges so far have included measuring of site utility, making it more social and interactive, updating the site on a long-term basis, and leveraging the digital platform to enhance face-to-face professional development.

School-day Alignment

The Providence After School Alliance (PASA) is working in partnership with the Providence Public School District to align existing informal science education activities more deliberately with the school day.

Through the Summer Scholars program, PASA pairs district teachers and community educators to jointly plan and implement summer programming in

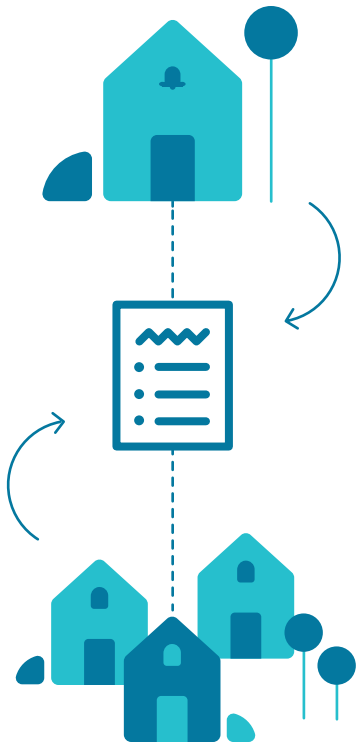
Focus on Assesment: The Common Instrument

The Common Instrument is a survey comprised of 18 self-report items that can be administered to youth 10 years or older to assess their interest and engagement in science. It is simple and quick to administer, easy to receive feedback on, and useable for pre-post analysis. The tool was developed by the ***Program in Education, Afterschool, and Resiliency (PEAR)*** in 2010, with support from the Noyce Foundation, in response to a dearth in the field of quick, easy-to-use youth assessment tools. ***www.pearweb.org***

hands-on learning sites, such as the environmental education center at Save the Bay, the Natural History Museum, and the Botanic Garden. Together, teachers and community educators lead four-week-long, hands-on STEM programs that integrate science, mathematics, and English-language arts elements to provide a robust experiential learning opportunity for participating youth. During the school year, PASA works with a range of informal science education providers to deliver high-quality STEM programs to middle school youth participating in their AfterZone network of after-school programs.

PASA is also working with after-school providers and Providence Public School District staff to better connect their program content to the science education goals outlined in the district's newly adopted district-wide core science curriculum, which is focused on inquiry-based science education.

Preliminary results from the Summer Scholars program have been positive. Teachers and community providers report valuing the opportunity to engage in professional development with one another. School-day teachers learn important youth development strategies that they can take back to their classrooms during the school year, such as empowering youth to lead activities, and community educators learn new pedagogical strategies to apply in informal settings.



Science Learning Communities

Techbridge, a STEM nonprofit that co-led the implementation of FUSE in California's Bay Area with the Partnership for Children and Youth, developed a robust professional development strategy, thanks in large part to a partnership with Oakland Unified School District (OUSD). In 2010, Techbridge and OUSD's Afterschool Programs Office created the Oakland Science Learning Community, a peer network through which after-school providers could share resources and best practices on how to engage youth in STEM. This partnership allowed OUSD after-school educators to benefit from the expertise of Techbridge; at the same time, it gave Techbridge a platform to expand its model for informal STEM education for underserved youth without having to grow its staff.

As part of the Science Learning Community, Techbridge leads regular trainings with after-school staff on a range of facilitation topics, like creatively embedding information about STEM careers into a hands-on activity. Overarching themes of inquiry and equity are woven into all trainings. Through inquiry, participants learn strategies to guide youth through the process of forming a hypothesis and testing different ideas to solve a problem. Participants also learn strategies for promoting an equitable learning environment so that all youth—girls and boys of all ethnicities, races, and language abilities—feel included in STEM.

Techbridge used a few key strategies to maximize the effectiveness of its trainings: scheduling them more heavily during the first part of the school year to get instructors up to speed quickly; emphasizing facilitation strategies over individual lessons or activities; and following trainings with coaching visits to explore staff members' strengths and areas for improvement. The emphasis on facilitation and coaching strongly and positively affected staff members' attitudes and beliefs about their abilities to deliver hands-on science activities.

One challenge has been developing a sustainable coaching model to give participants in the Learning Community individualized feedback. In past years, Techbridge trainers served as the primary STEM coaches, but this required a considerable amount of staff time. As Techbridge looks to scale up learning communities, it is exploring alternatives to this structure, such as incorporating school-day teachers as coaches.

Program Quality Assessment

Evaluation of FUSE jurisdictions found that those who used a standard quality assessment tool (e.g., the STEM Program Quality Assessment tool or Dimensions of Success observation tool) on a consistent basis displayed high-quality activities. Sites used different tools to assess and improve program quality.

Spotlight: Dimensions of Success

The Dimensions of Success (DoS) observation tool was designed by the Program in Education, Afterschool, and Resiliency (PEAR) at Harvard University in collaboration with Educational Testing Services (ETS) and Project Liftoff. The tool consists of 12 "dimensions" with four levels of quality: Features of the Learning Environment, Activity Engagement, STEM Knowledge and Practices, and Youth Development in STEM.

> Teachers and community providers report valuing the opportunity to engage in professional development with one another. School-day teachers learn important youth development strategies that they can take back to their classrooms during the school year and community educators learn new pedagogical strategies to apply in informal settings.

Prime Time Palm Beach County and Boston After School & Beyond both elected to use the DoS tool, largely because of its strong emphasis on youth development principles, such as youth voice and relationships. The training coordinators at these two sites, who scored video observations and completed four site visits before receiving certification, appreciated that the tool asked for justification of the numeric scores, forcing them to analyze the factors that made their STEM programming "successful" or "unsuccessful." They also noted the support they received from PEAR staff and other frontline OST staff through a discussion forum hosted by PEAR.

Spotlight: STEM Program Quality Assessment

Another available observation tool is the STEM

Program Quality Assessment (PQA) tool, which was developed by the David P. Weikart Center for Youth Program Quality in conjunction with PASA. The STEM PQA is based on the Weikart Center's validated and field-tested Youth Program Quality Assessment (YPQA) tool, which was designed to evaluate the quality of after-school programming and includes an assessment of the following domains: safe environment, supportive environment, interaction, engagement, and youth-centered policies and practices (i.e., agency). The STEM PQA builds upon the items within these domains, includes supplemental STEM-specific items, and assesses supplementary domains such as STEM skill-building and staff STEM program preparation. It also includes an interview section.

PASA has used the STEM PQA since 2011 to conduct activity observations and provide coaching to frontline staff members. The tool has been helpful for PASA to identify areas for improvement in delivering STEM programming, such as building STEM skills or offering youth greater opportunities for agency and reflection. After School Matters also brought in staff from the Weikart Center to train its frontline staff in use of the STEM PQA once it began implementing FUSE in Chicago in 2012. (In addition, the tool has been used as part of external FUSE evaluations.)

Impact

For the past three years, TASC has conducted evaluations of the FUSE initiative to determine its effectiveness and impact on outcomes at the program, staff, and student levels. The evaluations focused on assessing goals relating to depth, sustainability, and spread, as outlined in the FUSE overview (p.11).

Methodology

TASC conducted interviews and collected surveys from Every Hour Counts management, grass-tops leaders, and their partners to address research questions around fidelity of implementation, evolution of informal science education initiatives, and impact of programs on attitudes and beliefs. TASC also conducted interviews with frontline staff and site coordinators, collected staff and student surveys, and observed informal science activities using the STEM Program Quality Assessment (PQA) tool. The Science Teaching Efficacy Belief Instrument (STEBI) was used to examine frontline staff members' confidence and perceptions about their impact on youth in after-school, while the Science Attitude Change tool and Common Instrument (p.15) were used to capture changes in youth attitudes toward science.

Findings

Key findings from the evaluations included:

1. *Participation in informal STEM activities increased students' science knowledge, confidence, and motivation, with varying effects by dosage and by gender.*
2. *Both grass-tops leaders and frontline staff believe that non-professionals can effectively lead science activities in after-school programs.*
3. *Experience and training increase instructional confidence for frontline staff members without STEM experience, closing the gap in confidence levels with their peers who have STEM backgrounds.*
4. *Jurisdictions that supported staff on a consistent basis, through e-learning communities, coaching, and/or observations with quality assessment tools, displayed consistently high-quality activities compared to other jurisdictions. However, frontline staff struggle in the areas of agency and supporting STEM skill-building when leading STEM activities.*

Lessons Learned

Dosage matters—for staff as well as students. Students who participated in informal science learning for more time showed higher science motivation and confidence. Similarly, frontline staff members who received more, and more regular, training demonstrated greater instructional confidence.

The gender gap among youth in STEM persists. Though male and female students express similar levels of science confidence and science knowledge, male students show significantly higher motivation in science than female students. While staff members do report having had occasional trainings on the gender gap in STEM and strategies for incorporating equity, a more intentional and focused approach is needed.

Survey methodology may affect student responses about science attitudes. For two years in a row, overall student attitudes toward science and engagement, as measured by the Common Instrument, declined from the pre-program to post-program survey. However, when students reflected retrospectively, they showed more positive attitude changes. This difference suggests that a response-shift bias may be occurring as students gain a deeper understanding of what science actually is.

Community educators can facilitate co-inquiry and STEM learning. Broadening the understanding of who can deliver high-quality STEM learning experiences helps build the case for after-school as a natural place to teach and engage young people in science.

Complete fidelity to model can be a challenge. Conditions on the ground can make it hard to realize every goal laid out in a proposal, such as for a specific number of participants in professional development activities. Specific, targeted technical assistance can help individual jurisdictions meet this challenge.

Intermediaries play a key role in building quality informal science education systems. Intermediary staff members, such as training coordinators or professional development managers, often develop strong relationships with frontline staff members, inspiring them and improving their confidence. Intermediaries also help broker partnerships and facilitate connections between disparate resources in a given community.

Strong partnerships with school districts help sustain STEM in OST. Strong relationships between the intermediary and local school district, especially at the leadership level, facilitate school/out-of-school linkages and help sustain after-school STEM programming.

Resources for the Field

Curriculum

To increase the delivery of informal STEM education in after-school, FUSE sites built on existing high-quality curricula and adapted them to meet the needs of local after-school sites, rather than creating their own curricula. FUSE intermediaries identified several curricula representing a broad range of STEM content and grade levels; each jurisdiction offers the curricula that are most appropriate for its local programs. Intermediary staff members are also available to sites to answer questions and provide counsel.

The following are examples of high-quality informal STEM education curricula vetted and used by FUSE partners.

After-School Math Plus

http://www.edequity.org/programs/science-and-math-programs#24

The four thematic units in After-School Math Plus—ArtMath, the Built Environment, Jump Rope Math, and Music Math—help students find the math in everyday experiences while developing essential skills and meeting National Council of Teachers of Mathematics (NCTM) standards.

HIGHLIGHTS:

Inquiry-based activities for afterschool centers, museum visits, student-created math exhibits, family involvement in the form of a culminating event

+ **Target Grade Level:** 3-8
+ **Training Hours:** 20 hours (4-5 hours/theme)

After-School Science Plus

http://www.edequity.org/programs/science-and-math-programs#23

Using everyday materials and a problem-solving approach, After-school Science Plus participants engage in activities that are fun and informative. Participants receive a bin of hands-on materials, a set of children's literature aligned with the activities, and a curriculum guide.

HIGHLIGHTS:

Parent letters in English and Spanish, role model biographies, literacy connections

+ **Target Grade Level:** K-8
+ **Training hours:** 5-20

CryptoClub

http://www.math.uic.edu/CryptoClubProject/

CryptoClub includes classroom and web-based material to teach cryptography and related mathematics, including mathematical patterns; decimals, fractions, and percentages; division with remainder; and common factors.

HIGHLIGHTS:

Games and activities, e.g. treasure hunts or "cipher tag," that involve sending and receiving secret messages; free leader materials with training

+ **Target Grade Level:** 6-8
+ **Training Hours:** 10-14 (or guides available for purchase on Amazon)

FIRST Robotics

http://www.usfirst.org/roboticsprograms

Youth of all ages work in teams to design and build LEGO models and robots. Annual programs culminate in an international robotics competition.

HIGHLIGHTS:

Real-world applications, eligibility for college scholarships for older students

+ **Target Grade Level:** 1-12
+ **Training Hours:** Various

Jewel of the Solar System

http://www.jpl.nasa.gov/education/index.cfm?page=319

Students use language and creative arts to explore the planet Saturn and make a personal connection to the excitement of scientific discovery and engineering design.

HIGHLIGHTS:

Need only ordinary classroom materials (chart paper, glue sticks, etc.)

+ **Target Grade Level:** 4-5
+ **Training Hours:** 4

NASA: Afterschool Universe - Bringing Astronomy Down to Earth

http://universe.nasa.gov/au/

Afterschool Universe is an astronomy program developed by NASA that explores astronomy concepts through engaging hands-on activities and takes participants on a journey through the universe beyond the solar system.

HIGHLIGHTS:

Free leader manual with training, low cost and easily acquired materials

+ **Target Grade Level:** 6-8
+ **Training Hours:** 6-14

SciGirls

http://scigirlsconnect.org/

SciGirls transmedia resources bring girls, families, and educators evidence-based practices in STEM education through videos, online resources, hands-on activities, and training workshops.

HIGHLIGHTS:

Episodes available on PBS TV and online, Spanish-language programs (SciGirls en Español and SciGirls en Familia) available for educators working with Spanish-language students and families

+ **Target Grade Level:** 3-8
+ **Training Hours:** 6-8

Techbridge

http://www.techbridgegirls.org/index.php?id=21

The multi-unit Techbridge curriculum is designed to interest kids in science and engineering, promote inquiry, and highlight real-world applications to interest students, especially girls, in STEM careers.

HIGHLIGHTS:

Focus on engineering (electrical, mechanical, computer, and green), career exploration. Activities can be led by Girl Scout troop leaders.

+ **Target Grade Level:** 6-8
+ **Training Hours:** 20 hours for full curriculum (training not required)

Wonderwise

http://wonderwise.unl.edu/

Wonderwise combines the investigations and personal insights of a variety of scientists. The lessons promote hands-on inquiry, diversity, and collaboration; encourage development of science skills; and provide female role models in the field of science.

HIGHLIGHTS:

Videos of scientist and science activities, free downloadable activities

+ **Target Grade Level:** 4-7
+ **Training Hours:** 2-3 hours per theme (11 themes)

Evaluation

Evaluation is critical to inform continuous quality improvement and to ensure successful implementation of STEM education in expanded learning settings. For example, pre- and post-program surveys can help programs identify whether or not a particular curriculum is resonating with students and to adjust programming accordingly. In addition, developing a strong, well-articulated evaluation plan can help programs seek additional support from public and private funders, who want to see their investments lead to positive outcomes for both staff and students.

The following strategies can help inform the development and implementation of a plan for evaluating informal STEM education.

Start by identifying the end goals of the program.

Any evaluation should begin with a logic model that clearly articulates a program's desired outcomes and the milestones to be crossed along the way. When identifying program and youth outcomes, program directors should be sure that the outcomes relate directly to the training that staff members are receiving and the curriculum being implemented. Youth outcomes can include anything from increased engagement, confidence, and positive attitudes about science, to academic performance measures and career plans. These can vary by age; at the elementary level, there may be a greater focus on engagement and performance in science at school, while outcomes for high-school students may be geared toward pursuit of STEM courses and careers.

Established, well-regarded frameworks, such as the National Science Foundation's informal science education evaluation framework (see p. 35), provide programs with helpful tools to develop their logic models and guide them through the larger evaluation process. Alternatively, program or jurisdiction-specific frameworks can also guide evaluation. Every Hour Counts created a logic model for the national FUSE initiative, along with a template that local jurisdictions can use. Boston After School & Beyond is guided by the "Achieve, Connect, Thrive" framework, which emphasizes skills that researchers and after-school providers have identified as important for success in school, college, and 21st-century careers.

Focus initial assessments on program fidelity.

The initial focus of evaluation efforts should be to assess and ensure program fidelity. If a program's logic model posits that staff training will produce better youth outcomes, program outcomes should include observations of trainings and interviews with staff who participate in the trainings. After ensuring that the training is delivered as planned, evaluation of the staff's readiness, engagement, and confidence to deliver STEM education should be assessed. These indicators can be measured through staff surveys, interviews, focus groups and observations. Once it is clear that staff members are delivering informal science education as they were trained, programs can begin to assess youth outcomes.

Build off existing assessment tools.

Programs can draw upon existing resources when developing their assessment tools. A range of tools are available for measuring program quality and youth outcomes. The website of the Program in Education, Afterschool, and Resiliency (PEAR) at Harvard University offers a comprehensive database of informal science education evaluation tools, such as the Common Instrument and Holistic Student Assessment for measuring student outcomes, and the Dimensions of Success observation tool for measuring program quality.

Plan ahead.

Programs can make the most of evaluations if they know beforehand what data they want to collect and analyze. The timing of survey administration is important; pre-surveys should be administered at the beginning of the program to have a true baseline from which to measure program results. Additionally, it is essential to plan ahead to ensure that sample sizes will be large enough to run statistical tests, draw meaningful conclusions, and make comparisons by subgroups, such as gender or ethnicity. Programs may combine or simultaneously administer surveys for external and internal evaluations to minimize the burden of data collection. Finally, intermediaries

may want to consider collecting supplementary, related data, such as youth program attendance or dosage of staff training, to examine the effects of these variables on youth or staff outcomes.

Sustainability Strategies

To ensure continued growth and long-term sustainability of informal STEM education in after-school, programs must be intentional about identifying public and private sources of support. The following are potential streams of funding to consider when developing a sustainability plan.

Private funding

STEM-focused businesses, including energy, technology, engineering, and telecommunications companies, are often seeking to invest in local youth projects. Local community foundations and national foundations with a focus on STEM, youth development, or workforce development are also likely funders.

- **The Foundation Center**

  The Foundation Center maintains a comprehensive database on U.S. and global grant makers and their grant programs and funding priorities. Membership is required to access the database, but many public libraries and state nonprofit networks can offer search assistance to nonprofit and community-based organizations. *www.foundationcenter.org*

Public funding

- **21st Century Community Learning Centers (21st CCLC)**

  Part of the Elementary and Secondary Education Act, 21st CCLC is the primary funding stream to support after-school programs across the country. After-school STEM programs supported by 21st CCLC funds draw on partnerships with local schools and STEM institutions, including museums and science centers, to implement engaging, inquiry-based activities. More information on 21st CCLC can be found at: *http://www2.ed.gov/programs/21stcclc/index.html.*

- **Career and Technical Education**

  The Carl D. Perkins Career and Technical Education Act makes federal funds available to help provide vocational-technical education programs and services to youth and adults. State recipients sub-grant funds to local education agencies and post-secondary education institutions to support programs that strengthen the academic, vocational, and technical skills of students; deepen students' understanding and experience in an industry; provide professional development to teachers, counselors, and administrators; and more. Additional information on Career and Technical Education funding can be found at: *http://www2.ed.gov/programs/ctesbg/index.html.*

- **Environmental Protection Agency**

  The Environmental Education Model Grants Program supports environmental education projects that promote environmental stewardship and help develop knowledgeable and responsible students, teachers, and citizens. Eligible applicants include nonprofit organizations, local or state education agencies, educational public broadcasting agencies, and others. The program provides financial support for projects that design, demonstrate, and/or disseminate environmental education practices, methods, or techniques that will serve as models and can be replicated in a variety of settings. The EPA's Educational Priorities include capacity building

and career development; Environmental Priorities include climate change, chemical safety, and water conservation. Total funding available for 2014 is approximately $2.78 million. *http://www2.epa.gov/education/environmental-education-ee-grants.*

- **National Aeronautics and Space Administration (NASA)**

  NASA issues annual calls for proposals to advance STEM learning opportunities in higher education, elementary and secondary education, and informal education—including science museums, planetariums, and NASA visitor centers. In addition, each NASA Science Mission Directorate has separate funding to support STEM education, including after-school. In June 2010, NASA launched the Summer of Innovation program, aimed at engaging middle school students, particularly those who are underrepresented and underperforming in STEM, in stimulating STEM education programs over the summer. The program includes NASA activities as well as mini-awards (up to $2,500 each) to educational organizations to infuse STEM content in after-school and summer programs. More information on funding opportunities through NASA can be found at: *https://nspires.nasaprs.com/external/solicitations/solicitations.do?method=init&staush.*

- **National Institutes of Health (NIH)**

  Through the Science Education Partnership Awards (SEPA) program, supported by the Division for Clinical Research Resources, NIH seeks to improve life-science literacy throughout the nation through innovative K-12 STEM and informal science education programs. SEPA-supported projects create partnerships among researchers, schools, museums and science centers, media experts, and other educational organizations. More information on SEPA can be found at: *http://www.ncrrsepa.org/.*

- **National Oceanic and Atmospheric Administration (NOAA)**

  Through education, NOAA aims to advance environmental literacy and promote a diverse workforce in ocean, coastal, Great Lakes, weather, and climate sciences, encouraging stewardship and increasing informed decision making for the nation. NOAA has ongoing funding opportunities to support formal and informal science education. More information on funding opportunities through NOAA can be found at: *http://www.oesd.noaa.gov/funding_opps.html.*

- **National Science Foundation (NSF)**

  NSF is an independent federal agency that promotes science and engineering through research programs and education projects. There are several opportunities to support after-school STEM programs through NSF, including a specific Advancing Informal STEM Learning program, which funds programs in a wide range of informal settings. NSF also funds the Innovative Technology Experiences for Students and Teachers (ITEST) program, aimed at developing the STEM workforce, and the Transforming STEM Learning (TSL) and Research and Evaluation on Education in Science and Engineering (REESE) programs, aimed at advancing research on STEM learning, education, and evaluation. More information on current funding opportunities through NSF can be found at: *http://www.nsf.gov/funding/.*

Partnerships

- **Convening stakeholders**

  Sustainability of STEM after-school programs relies on strong and diverse partnerships. Leveraging resources from local museums, aquaria, and zoos can enhance content delivery and expose students

to new environments. (The Association of Science–Technology Centers can be a helpful resource for connecting to such organizations.) These groups are interested in developing local partnerships and often have their own curricula and materials, which after-school programs can build upon to expand informal STEM learning activities. Institutions of higher education can also be vital partners, providing access to STEM professionals, equipment, and other resources. And strong relationships with city and state leaders and government agencies can not only bring funding, but also inform the implementation strategy. Formalizing partnerships among these stakeholders enables after-school programs to expand and deepen informal STEM learning experiences and is an effective strategy to attract funders who are looking for the biggest impact from their investment.

- **Building informal science education systems through coordinating entities**

  Real sustainability requires systemic efforts to create informal STEM education infrastructure at scale. Intermediaries, such as the Every Hour Counts partners and statewide after-school networks, can help bolster support for after-school STEM by leveraging public and private resources and brokering relationships with key stakeholders. Intermediaries can help build public will so that STEM is considered an expectation in after-school, not an extra. Intermediaries can also help support this culture shift by convincing funders and policymakers that investments in high-quality informal STEM learning experiences are critical to young peoples' future success.

- **Educate to Innovate campaign**

  In 2009, President Obama launched the "Educate to Innovate" campaign, a nationwide effort to improve STEM participation and achievement in the U.S. over the next decade. Through public-private partnerships among the federal government, leading businesses, universities, foundations, and non-profits, the campaign aims to connect young people to STEM experiences, increase STEM literacy, and help prepare and inspire the next generation of STEM professionals. Partnerships through the campaign present an opportunity to help build a stronger system to support STEM learning both in and out of school.

  + **Examples of current partnerships include:**

    - Change The Equation, a nonprofit CEO-led initiative that is mobilizing the business community to improve the quality of STEM learning in the U.S. by connecting philanthropic and advocacy efforts and inspiring youth to pursue STEM.

    - "Connect a Million Minds," a campaign designed to connect over one million students to highly-engaging after-school STEM activities using Time Warner Cable's media platform, Public Service Announcements, employees, and the "connectamillionminds.com" website.

    - US2020, a partnership among leading education non-profits and technology companies to expand STEM mentoring capacity.

For more information on the Educate to Innovate campaign, visit: *http://www.whitehouse.gov/issues/education/k-12/educate-innovate.*

What's Next?

As educators, community-based organizations, and policymakers increasingly recognize the value of expanded learning opportunities to support high-quality STEM learning activities, they will be looking for ways to scale informal science education, to establish common learning and youth development goals and indicators for the field, and to build capacity among frontline staff and demand among STEM stakeholders to meet those goals. A few trends to watch include:

1

Connections to the workforce. STEM-focused businesses, including energy, technology, engineering, and telecommunications companies, are looking for American workers with skills to succeed in STEM careers. While such businesses have long supported STEM education through corporate giving and mentoring programs, they are beginning to take a more direct approach to collaboration. Companies like GE, BMW, Caterpillar, and IBM are partnering with local governments and vocational and technical education programs to ensure that youth are adequately trained for STEM jobs at their companies. In October 2012, President Obama visited the site of one such partnership—the Pathways in Technology Early College High School in New York (P-Tech), where graduates become eligible for entry-level jobs at IBM—and called it a model for the nation.

2

Landscape scans. Citywide surveys of STEM OST programs, such as the one conducted by the Chicago STEM Pathways Cooperative, can help provide an overview of existing opportunities, as well as help identify gaps in those efforts—whether in terms of neighborhoods served, demographic or age groups reached, or content areas covered.

3

Equity strategies. As cities expand their capacity to deliver high-quality science education, they will have to apply specific strategies to ensure that all youth, including girls and low-income and minority youth, have opportunities to engage in STEM content and develop STEM identities. This is of particular importance for closing gaps in STEM achievement and meeting the demand for qualified STEM professionals in the workforce.

4

Partnerships with formal K-12 educators. Coordination between in-school and out-of-school educators ensures a more seamless and engaging learning experience for students. In communities like New York, Oakland, and Providence, intermediary organizations are facilitating partnerships between public school districts and community-based institutions around professional development, enabling formal and informal educators to plan together, learn from one another, and share pedagogical and youth development strategies. For example, TASC is partnering with the New York Hall of Science to implement the STEM Educators Academy, a program of joint trainings, workshops, and ongoing observation and coaching for New York City Public Schools teachers and community educators. Such coordination is likely to become more popular as informal learning experiences are increasingly viewed as an integral part of a comprehensive strategy to improve overall STEM education.

5

Online and blended professional development. Achieving scale while maintaining a high-quality level of instruction is a challenge. Online professional development, or blended strategies that combine virtual training and in-person support, can help organizations support a greater number of frontline staff. The Noyce Foundation, S.D. Bechtel Foundation, and University of Nebraska-Lincoln have undertaken a major effort to provide a comprehensive suite of online resources, called Click2SciencePD, to help frontline staff develop 20 essential skills for instruction.

6

Assessment, with a focus on social and emotional learning. There is increased interest in the field in identifying the learning indicators and outcomes that are specifically appropriate for out-of-school time STEM programming, and measuring the success of programs against those metrics instead of by schools' metrics. The expanded learning field has also in recent years articulated a clearer emphasis on social and emotional learning—skills like grit, persistence, resilience, belief in one's ability to learn new things, and teamwork—and this focus will inform the discussion about the desired outcomes of informal science education as well.

7

Alignment to Next Generation Science Standards. A new set of science standards aligned to the Common Core State Standards in Math and English Language Arts were finalized in 2013. The Next Generation Science Standards (NGSS), which emphasize depth over breadth, are organized around three dimensions: the practices that scientists use to test theories, build models, and design solutions; the cross-cutting concepts that apply across scientific domains; and core ideas from the main science disciplines. With more and more states likely to adopt and implement the NGSS, informal science educators are increasingly seeking to align their programming and curricula to the standards and their goals.

Reference Guide: Informal STEM Education Resources

After-School Publications

Afterschool: A Vital Partner in STEM Education

Afterschool Alliance, S.D. Bechtel, Jr. Foundation, Time Warner Cable, May 2011

This report makes the case for building after-school partnerships around STEM and expanding the capacity to deliver high-quality informal STEM education.

http://www.afterschoolalliance.org/Afterschool_as_STEMpartner.pdf

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Culturally Relevant Strategies to Build Student Interest in Science

Relating Research to Practice, 2013

This brief relates a study of exemplary African-American teachers and their approaches to developing interest in science among low-income African-American elementary students to practice.

http://relatingresearchtopractice.org/article/253

Engagement, Capacity and Continuity: A Trilogy for Student Success

Science Museum of Minnesota and Campbell-Kibler Associates, Inc., 2004

This paper introduces a system to analyze what is needed for individual students to be successful in mathematics and science.

http://www.smm.org/static/about/ecc_paper.pdf

Identity and Persistence in STEM: Why It Is Important to Think about How Women and Girls See Themselves in Science and Engineering

Women in Engineering ProActive Network (WEPAN), 2011

This webinar explores what it means to have a science/engineering identity, what and who influences that identity, and how gender plays a role.

http://vimeo.com/30814301

Out-of-School Time Science Activities and Their Association with Career Interest in STEM

International Journal of Science Education, 2011

This study examines the association between OST science activities and science interest in middle school and STEM career interest in university.

www.tandfonline.com/doi/abs/10.1080/21548455.2011.629455#.UqtCq0qMk00

Partnerships with STEM-Rich Institutions

Afterschool Alliance, 2013

Expanded learning programs can partner with STEM-rich institutions—science centers and museums, universities and colleges, businesses, and government agencies—to impact students as well as instructors.

http://www.afterschoolalliance.org/issue_61_STEM.cfm

Reversing the Swing from Science: Implications from a Century of Research

Cary Sneider, 2011

This paper summarizes a century of research on youth motivation in science and urges researchers to build on each other's work and communicate findings to influence policy and practice.

http://www.noycefdn.org/documents/Sneider-The%20Swing%20from%20Science.pdf?v=snKYxbC8xiA

Science Beyond the Classroom: Critical to New York's Future

New York State Afterschool Network, 2012

This statewide network issue brief argues, that high-quality science learning outside the traditional classroom is critical to young people's success, and examines the role of expanded learning opportunities in providing more young people with inspiring, transformative science learning.

http://www.nysan.org/content/document/detail/3664/

Science by Stealth

Education Week, 2006

This classic article by TASC President Lucy Friedman and Jane Quinn, Vice President and Director of the National Center for Community Schools at the Children's Aid Society, describes the value of science in after-school.

http://www.edweek.org/ew/articles/2006/02/22/24friedman.h25.html

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Shifting Expectations: Bringing STEM to Scale through Expanded Learning Systems

Afterschool Matters, 2013

The 2010-2011 evaluation of the national FUSE demonstration offers lessons on how expanded learning opportunities can help address the STEM education crisis.

http://www.niost.org/images/pdf/afterschoolmatters/asm_2013_17_spring/ASM_2013_spring_2.pdf

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Surrounded by Science: Learning Science in Informal Environments

Board on Science Education, Center for Education, 2010

This book offers case studies and probing questions to support practitioners in informal science settings with instruction, program design, and development of students' science identities.

http://www.nap.edu/openbook.php?record_id=12614&page=1

Vital Signs: Reports on the Condition of STEM Learning in the U.S.

Change the Equation, 2012

Change the Equation and Nielsen surveyed more than 17,000 U.S. households with children in grades K-12 to assess the extent of participation nationally in STEM programs outside of the school day.

http://changetheequation.org/sites/default/files/CTEq%20Vital%20Signs%20Lost%20Opportunity.pdf

Curriculum

4-H

Curricula from the National 4-H Council and Cornell Cooperative Extension include youth activity guides in the areas of life science, engineering and technology, and environmental science and energy.

http://www.4-h.org/resource-library/curriculum/science-curriculum/

Great Science for Girls

This site provides reviews and information about how to implement eight recommended STEM curricula.

http://www.greatscienceforgirls.org/curriculum

Science After School Consumers Guide

This guide contains reviews of high-quality, hands-on science content for after-school programs.

http://www.sedl.org/afterschool/guide/science/

SEDL

The Afterschool Curriculum Choice: Technology Resources collection is designed to help practitioners locate and make informed choices about high-quality technology resources to enrich their programs.

http://www.sedl.org/afterschool/guide/technology/

Smithsonian Science Education Center

The Science and Technology Concepts (STC) Program, developed with support from the National Science Foundation and published by Carolina Biological, offers an inquiry-based science curriculum for grades K-10 that covers the life, earth, and physical sciences.

http://www.ssec.si.edu/curriculum/overview

Staff Training

"5 E's" Instructional Method

This online module walks frontline staff through the "5 E's" (Engage, Explore, Explain, Extend, Evaluate) instructional method for science education.

http://primetimepbc.org/sites/default/files/webform/5%20E%E2%80%99s.swf

Click2SciencePD

A new online platform with videos, training agendas, and other resources to help organizations cultivate essential skills among frontline staff.

http://www.click2sciencepd.org

Great Science for Girls

Resources to support successful staff development trainings for Great Science for Girls.

http://www.greatscienceforgirls.org/take-action/staff-development

National 4-H

Professional development tools and opportunities for staff and volunteers.

http://4-h.org/resource-library/professional-development-learning

National Partnerships for After School Science to Scale (NPASS2)

Resources for professional development for out-of-school time science activity leaders.

http://npass2.edc.org/resources/pd-tools

SEDL National Center for Quality Afterschool

Toolkit for staff development in science and a resource guide for after-school staff members.

http://www.sedl.org/afterschool/toolkits/science/

☑ Evaluation

David P. Weikart Center for Youth Program Quality

The Youth Program Quality Assessment (YPQA) and STEM extension were designed to address the quality of learning environments and to identify staff training needs.

http://www.cypq.org/downloadpqa

Defining Youth Outcomes for STEM Learning in Afterschool

This report offers a common framework and language for providers on developmental outcomes and learning indicators for STEM in after-school.

http://www.afterschoolalliance.org/STEM_Outcomes_2013.pdf

Framework for Evaluating Impacts of Informal Science Education Projects

This document, from the National Science Foundation, provides a detailed framework for evaluating informal science education projects.

http://informalscience.org/documents/Eval_Framework.pdf

Game-Changers and the Assessment Predicament in Afterschool Science

This paper describes gaps in OST science assessment and the need for the after-school field to take the lead in establishing relevant indicators and assessment tools.

http://www.pearweb.org/research/pdfs/Noam&Shah_Science_Assessment_Report.pdf

Informal Science

Website to share informal science education project impacts and evaluation findings, as well as to help guide evaluation frameworks for informal STEM education.

http://informalscience.org/evaluation

National Girls Collaborative Project

User-friendly instruments, websites, and evaluation guides to help girl-serving STEM programs effectively evaluate and assess their efforts.

http://www.ngcproject.org/evaluation-assessment

The Program in Education, Afterschool, and Resiliency (PEAR)

This website houses a variety of resources related to evaluation, including a database of assessment tools to measure performance of informal and out-of-school science, technology, engineering and math programs.

http://www.pearweb.org

Sustainability

Afterschool Alliance

A STEM funding brief details opportunities for federal and private funding, as well as tips for a successful application.

http://www.afterschoolalliance.org/STEM-Funding-Brief-10182012.pdf

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Educate to Innovate

Information on the federal initiative to improve the participation and performance of America's students in STEM.

http://www.whitehouse.gov/issues/education/educate-innovate

State of STEM in OST in Chicago

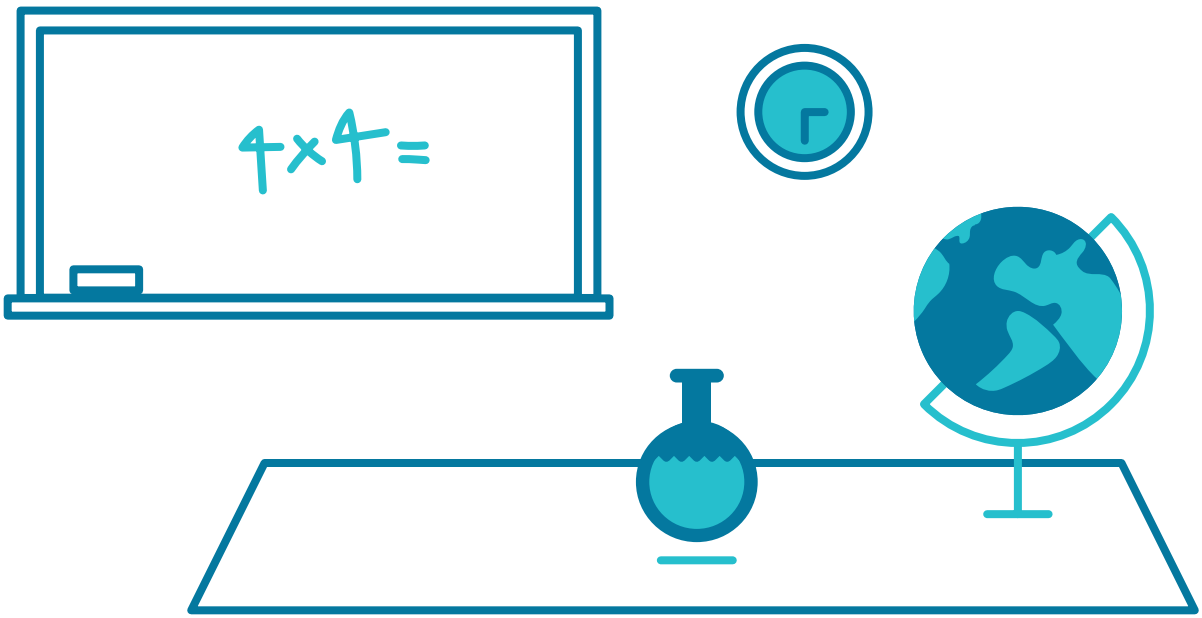
The Chicago STEM Pathways Cooperative produced a comprehensive survey of STEM opportunities in out-of-school time across the city of Chicago. The document provides a useful example for other cities interested in conducting a landscape scan as a first step toward building a citywide system for informal STEM education.

http://stemchicago.files.wordpress.com/2013/06/stemost-report_fnl_0606131.pdf

STEM Grants

This site provides information concerning STEM funding opportunities from federal agencies, state governments, foundations, and corporations. The site also identifies recent STEM grant winners, features news related to STEM funding trends, and offers insights on developing proposals.

http://stemgrants.com/



About Every Hour Counts

Every Hour Counts, formerly the Collaborative for Building After-School Systems, is a coalition of citywide organizations that increase access to quality learning opportunities, particularly for underserved students. The organization is a leading voice promoting expanded-learning systems, which provide learning and enrichment through after-school, summer, and other initiatives. Expanded-learning systems help students be more connected to school, build self-confidence, and connect with caring adults, so every student can thrive.

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This guide was authored by Nina Agrawal, Policy and Communications Coordinator, and Jessica Donner, Director, Every Hour Counts.

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