Navigating the Future of Afterschool Science

Afterschool Science Networks Study

Recommendations

SRI Education

The SRI Education Afterschool Science Networks Study

Contents

Navigating the Future of Afterschool Science

Introduction

For years, the belief that informal science and afterschool programs are a great match has been widely shared. This belief has been articulated in models and frameworks of science in informal learning— or what many now call expanded learning—settings created by the National Research Council, the Coalition for Science After School, the Afterschool Alliance, and the California Afterschool Network, among others.

With the advent of the Next Generation Science Standards, which emphasize science practices and inquiry, and with increased interest in networks supporting afterschool science (e.g., Mott Foundation-supported national and statewide afterschool networks), as well as initiatives to support afterschool science, such as the Power of Discovery: STEM^2, there is new reason to take a wider view of the potential of afterschool programs as part of the science–learning ecosystem.

SRI's Afterschool Science Networks (ASN) study provides new insights and empirical findings regarding the offering of science learning opportunities at scale. Four meetings of afterschool and informal science stakeholders were held in March and April 2014 to discuss the ASN findings generated from 5 years of research (see research summary on page 12). These stakeholders helped SRI Education researchers generate a vision of science in afterschool settings, as well as recommendations for strengthening the field. This document presents this vision of powerful afterschool science and provides a set of recommendations to support afterschool settings at scale.

Vision

In the vision of afterschool science expressed by afterschool and informal science stakeholders, the science learning environment, activities, staff, and program contexts combine to yield opportunities for youth to engage in hands-on science learning experiences (including science inquiry experiences) that are well grounded in youth development principles and practices and that participants find personally meaningful. There are three critical components supporting these science activities: the context, the staff, and available resources.

The ideal afterschool science experience takes place in a ***positive youth development context*** where youth and staff build and maintain a caring and supportive environment in which they work and learn together. In this setting, there is enough time and space to offer activities where youth can investigate and get messy with ideas and materials. Science activities encourage youth to develop their skills and knowledge by exploring, making sense of, and problem solving about the natural world. Program activities depend on youth making real choices, exploring issues of personal relevance, and making connections to their lives outside the program.

Well-prepared staff members, ready to guide interest-driven learning rather than deliver content, facilitate afterschool science activities. They are skilled in session preparation, ask questions in order to guide youth discovery, remain flexible and improvisational during the sessions, actively promote equity among youth, and are confident in their ability to lead science activities in ways that include staff and youth learning together. The staff members are intimate with the community the afterschool program serves and join in collaborative experiences with K-12 partners.

Finally, the afterschool program has ***resources and collaborating partners*** to support its science offerings. Resource materials, training, and science expertise are available to support science offerings through K-12, community-based, science institution or other external partners. Programs and partners are organized to support staff members in strengthening their practice and creating innovative strategies for engaging participants. Public policies and afterschool program funding are structured to support such partnerships.

Research Foundation

The ASN study findings provide a rigorous empirical research foundation for these recommendations. The study describes the science learning opportunities in state-funded afterschool programs serving high-needs students in California. Principal study data were collected in 2011–12, before major initiatives designed to improve the quality and availability of science learning experiences in the state afterschool system.

The ASN study found that most afterschool programs were interested in and were trying to include science in their regular offerings but that other activities such as arts, sports, or tutoring were far more common. About half the sites in the study offered science once a week or more, while half offered science less than weekly.

At the same time, the study revealed that at an average afterschool program in this large-scale system, youth had limited opportunities to explore their worlds through science practices and answer their own questions. The science activities offered in these settings tended to be procedural, limited in scope, guided by narrow learning goals, and facilitated by staff who did not have training in how to lead science activities and had very limited opportunities for professional development on science. In addition, the instructional materials staff used to support science activities tended to be limited to "one–off," activities found on the Internet or in activity books, which often do not contain enough supports for staff and youth to deepen or broaden their science practice or expand their vision for what afterschool science activities should accomplish. When sites planned for science with materials, they also tended to plan only one session at a time, even if they were using curriculum, rather than creating ongoing learning experiences that articulated with and built on one another.

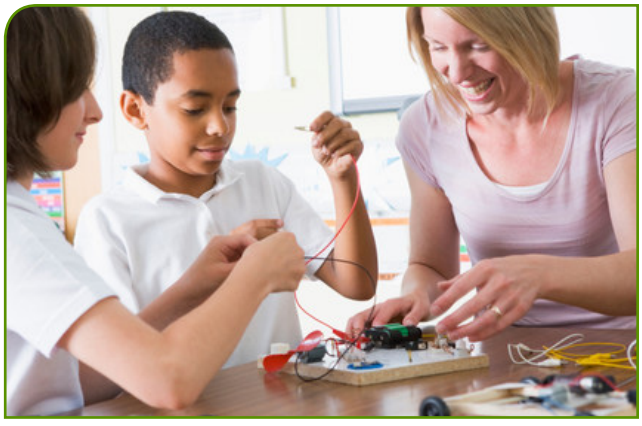
However, ASN research also showed that there were aspects of afterschool programming that were positively associated with more frequent science offerings, more use of inquiry practices that connect to youth's interests, and opportunities for youth choice and leadership:

- ***Partnering with an outside organization that can provide additional resources.*** Sites that had external partners—most of which provided professional development—offered more science and more inquiry science experiences. Most sites connected with one local partner organization.
- ***Having a staff member responsible for science.*** We found that this had a positive association even if this person was not a science content expert.
- ***Having staff members with a background in science or youth development.*** Programs with staff well versed in science or youth development were associated with more inquiry science learning opportunities. In particular, it is more important that the staff has an understanding of the nature of science and how science is conducted than extensive science content knowledge. This understanding helps staff take an inquiry approach to science, adopting a problem-solving approach to addressing youth's questions and ideas rather than trying to give answers and instructions.

Recommendations

These recommendations are intended to provide specific guidance, rooted in research, that can help the field move closer to the vision of powerful afterschool science described above. For the most part, they will not surprise knowledgeable readers because they arose out of the shared experiences of practitioners, funders, policy makers, researchers, and others at the meeting point of informal science and afterschool learning. All these recommendations are actionable within the next 5 years, and much sooner for many of them.

We have written the recommendations at four levels: staff, program, policy, and research. Our recommendations describe what we believe staff could be doing to improve the science activities that they plan for and facilitate. At the program level, we recommend the resources that programs can provide to enable staff to make improvements. These resources include time and scheduling, professional development for staff, and ways to build capacity through school collaborations and partnerships with outside organizations. Programs, in turn, may not have the resources to implement these recommendations on their own, which is why we also provide recommendations for policy makers, government agencies, and school districts, as well as foundations and other types of organizations that fund or support afterschool programming. Finally, we provide a set of recommendations for additional research that would benefit the field.



1. Recommendations for Staff

Expand vision for science

- Staff think beyond "doing science" by selecting learning goals from a broader set of possibilities—sparking interest in science practices and the natural world, supporting youth in choosing to engage in science activities, or building mastery of science practices and natural phenomena—identified by the field.
- Staff articulate clear and purposeful goals for science activities that connect to overall goals of the science program, so that science activities are more intentionally connected to longer term learning goals and support the development of mastery.
- Staff seek out information to help expand their vision—for example, by asking colleagues or science teachers, searching for informal science learning resources online, and consulting websites of established informal science learning organizations.

Improve staff capacity

- Staff seek out, request, and participate in professional development opportunities to build their understanding of how to facilitate science activities that
  - Are active and meaningful, involve collaboration, support mastery, and expand youth's horizons
  - Develop youth's interest in science
  - Promote understanding of science knowledge
  - Engage youth in science reasoning
  - Engage youth in reflections on science
  - Engage youth in science practices, including investigations, experiments, and other types of inquiry
  - Help youth identify with science.

Select supportive learning materials

- Staff select instructional materials for science activities that
  - Align with a program's science learning goals
  - Are active and meaningful, involve collaboration, support mastery, and expand youth's horizons
  - Include supports for staff and youth to
    - Develop youth's interest in science
    - Promote understanding of science knowledge
    - Engage youth in science reasoning
    - Engage youth in reflections on science
    - Engage youth in science practices, including investigations, experiments, and other types of inquiry
    - Help youth identify with science.
  - Allow for flexible activity schedules and ranges of staff knowledge and experience and can be used in a variety of locations.
  - Support opportunities to learn skills through sequential, connected opportunities that are increasingly challenging and complex.

2. Program Recommendations

Prioritize science

- Program designates one staff member to be in charge of science for the program, who can champion science, coordinate activities and resources, and possibly also lead science activities with youth.

Organize time for science

- Program makes science a part of the afterschool schedule as often as possible, which allows for more continuity between sessions, and longer-term, project-based learning experiences or science experiments and investigations over time.
- Program schedules sessions for protected times during the program day (e.g., before early pickup), so that youth have opportunities to work on their projects without interruption.
- Program schedules longer blocks of time for science (1.5–2 hours) so that facilitators and youth can maximize the amount of time spent on science activities in between setup and cleanup.

Support professional development

- Program explores new strategies and modes of professional development supporting staff in designing and facilitating science activities because time and resources for professional development will most likely remain scarce.
- Program compensates staff for time spent preparing activities and building their professional skills and knowledge to ensure full and consistent participation.
- Program makes frequent, ongoing professional development—including training, observation, and coaching—available to staff rather than single workshops.
- Program provides opportunities for staff to collaborate, develop and test ideas, and then reflect on their practice.
- Provides staff opportunities to experience activities firsthand, as well as focus on how to facilitate the activities with youth, in preparing to use instructional materials.

Support collaboration between afterschool and school staff

- Program supports reciprocal learning arrangements between school day staff and afterschool staff to
  - Build shared understanding of students' needs.
  - Collaborate on science projects (e.g., creating recycling programs, studying food systems)
  - Provide service learning opportunities for educators.
- Program provides youth development training or guidance for school-day staff working in afterschool.
- Program provides school-day teachers opportunities to observe their students participating in inquiry science in the afterschool setting.
- Program creates opportunities for afterschool staff to collaborate with school-day teachers on science activity selection and program goals, building connections for students between what they learn in the classroom and their afterschool science learning.

Build capacity through partnerships

- Program identifies and works with partners who can provide additional resources, such as training, materials, intellectual capital, funding, and science expertise.
- Program partners with outside organizations (e.g., local education agencies, content experts, community agencies, colleges, museums, and science institutions) that can help meet clearly articulated science program goals.
  - Ensures that partnerships are intentional, purposeful, and directly support program goals.
  - Works with organizations that focus on science whenever possible, which include not just science museums, but a range of community organizations that can provide access to rich science experiences for youth.
- Program partners with higher learning institutions.
  - College students can help support and provide afterschool science learning opportunities in exchange for academic credit/service-learning course work.
  - Science experts can provide insight, materials, role-modeling, site visits, and other opportunities for afterschool sites.

3. Policy and Funding Recommendations

Encourage programs to develop clear and ambitious goals for science

- Ask or require programs to clearly articulate their goals for science learning as part of their reporting or evaluation requirements, grant applications, or requests for technical assistance support.

Support the development of partnerships and networks

- Encourage programs to create and sustain partnerships through technical assistance support for how to seek, maintain, and manage partnerships; grants or other types of funding for supporting partnership development; and technological platforms and tools for partnership facilitation.
- Support organizations or agencies that work to provide science support for afterschool programs, in particular those local to afterschool sites.
- Invest in long-term partnership and network initiatives by supporting the growth and development of relationships, including opportunities for face-to-face meetings.

Support professional development

- Provide adequate funding for staff professional development and for programs to compensate staff for professional development and planning time.

4. Research Recommendations

Target partnership and network research on specific areas of practice

While the findings of this study indicate the influence and importance of partnerships on science offerings, questions still remain about the impact they have, which models are more successful, and how partnerships develop and are maintained. Further research should

- Continue to explore the degree to which social networks influence opportunities to learn within specific geographic areas (city, county, or region).
- Describe the types of partnership and forms of resources that provide the greatest benefits to programs.
- Describe the life span and attributes (e.g., type and quality of support) of partnerships, including how they form and change over time.

Conduct implementation research

Most research on afterschool science is focused on the implementation of particular programs or interventions. But there is to date no research base for implementation of various resources in afterschool programs more generally. Further research should

- Study enactment of afterschool science learning activities to better understand how learning materials, professional development, and other resources combine to shape opportunities to learn science in afterschool programs.

Study outcomes

Most research on the outcomes in afterschool programs tends to address youth and a narrow set of outcomes. There is a need to better understand the benefits of afterschool science more broadly for both adults and youth. Further research should

- Study the impact on adults and youth of afterschool science learning, using tried-and-true as well as novel and innovative evaluation and assessment approaches that are aligned with the goals and strengths of afterschool.

Design research on instructional materials

ASN research indicates that afterschool programs typically use learning materials that are either single activities found online or curricular models that are school based, including those created for the afterschool environment. Further research should

- Design and test new curricular approaches or instructional materials that are appropriate for the unique setting and challenges of afterschool programs.

Forum Background

SRI Education, in collaboration with the California Afterschool Network, hosted four forums in March and April 2014 with key actors in the California afterschool and informal science to

1. Disseminate research findings on science education in California's state-funded afterschool programs and

2. Develop recommendations for the future of afterschool science.

The forums were framed by the findings of the Afterschool Science Networks study, a research project sponsored by the National Science Foundation. The study was a 5-year examination of informal science offered in California's After School Education and Safety (ASES) program sites, exploring the frequency and features of afterschool science offerings in ASES programs, the resources and sources of support underlying those offerings, and the influence of external supports on the features of science offerings. The study is unique in its scope, involving a representative sample of the more than 3,700 afterschool programs that were served throughout the state at the time of the study. ASES now serves more than 4,100 afterschool programs.

The four forums held across the state engaged funders, policy makers, researchers, program operators, and others whose daily work influence and shape afterschool experiences for youth. Participants reflected on the SRI research findings and discussed the future of science education in California's afterschool programs.

Organizations represented by forum participants

- Alameda County Office of Education
- Butte County Office of Education
- Fresno County Office of Education
- Los Angeles County Office of Education
- Sacramento County Office of Education
- California Department of Education, After School Division
- Modesto City Schools–Intervention Programs
- San Bernardino County Superintendent of Schools
- L.A. Regional STEM Hub
- Cooperative Extension San Benito County
- Workforce Development San Mateo County
- San Bernardino County Superintendent of Schools
- San Bernardino Community College District
- UC Irvine
- Beyond the Bell–Los Angeles Unified School District
- S. D. Bechtel, Jr. Foundation
- California School-Age Consortium (CalSAC)
- Woodcraft Rangers
- After School All Stars, Los Angeles
- A-MAN, Inc.
- YMCA of Silicon Valley
- LA's BEST
- THINK Together
- TechBridge Girls
- Lighthouse Community Charter
- Community Science Workshop Network
- NASA/Jet Propulsion Laboratory
- Discovery Science Center
- California Academy of Sciences
- Mainspring Consulting
- NextEd
- Central Valley Afterschool Foundation
- Temescal Associates
- Partnership for Children and Youth

Summary of Research Findings

Science Learning Opportunities

- A large majority of sites offered science (87%), but popular activities like arts, sports, or tutoring were provided more often.
- About half the sites (48%) offered science weekly or more, while about another half offered science less than weekly.
- Opportunities for youth to explore their worlds and answer their own questions using science inquiry were uncommon.

Science and Site Characteristics

- Four site characteristics were associated with more frequent science, more inquiry practices, connecting to youth's interests, and opportunities for youth choice and leadership:
  - Having a partner that supported science programs
  - Having a staff member responsible for science
  - Having staff members with knowledge of science
  - Having staff members with knowledge of the nature of afterschool activities.

87% of sites offered science

48% of sites that offered science provided it weekly or more

63% of sites that offered science had a partner that supported science programming

Sites reported that most partners were local within 50 miles

Partnerships

- Most sites (63%) had a partner that supported science programming—most often community-based organizations or school districts.
- Partners most often provided training, resources, or directly led science programming.
- Most sites with partners (95%) had one partner supporting their science offerings (5% had more than one partner).
- Across the state, sites reported that most partners were local (within 50 miles).

Network

- Networks of support were not centralized or extensive.
- The network was generally made up of 1:1 connections, with some signs of nascent network components.

Instructional Materials

- Sites selected materials that were fun, easy to use, and had support features to help staff lead activities, such as discussion questions.
- Sites mostly used materials from the Internet and activity books, although curriculum materials had more support features for staff members.
- Sites planned one session at a time—even when they used curriculum.
- Sites were constrained by time and the staff's lack of science background.

Study Background

The Project Explored

- The nature of elementary afterschool science offerings
- The resources and sources of support for science programming and staff development
- Ties between offerings and external supports

Study Context—California's Public Afterschool Program

California's After School Education and Safety (ASES) program is the largest state-funded afterschool program in the country ($550M each year).

- More than 4,100 ASES afterschool sites exist across the state (all with at least 50% free and reduced price lunch population).
- ASES funds locally driven programs at schools and other community settings.
- Each grant represents a community–based organization (CBO) school partnership.

5 Study Components

Program Survey	Gathered information regarding science offerings, science materials, and partnership. Sampled to represent ASES programs *(N = 415) (2010–11).*
Case Studies	Observed science and interviewed staff, site coordinator, and partners. Sampled for programs with rich and frequent science *(N = 9) (2011–12).*
Support Partner Survey	Interviewed or surveyed all available organizations named by sites as science partners regarding the supports they provide *(N = 61) (2012).*
Instructional Materials Analysis	Examined the materials sites use for science, focusing on the support features included in different types of materials *(2013–14)*.
Social Network Analysis (SNA)	Used SNA to examine connections among sites, their partners, and the partners of partners *(2013–14)*.

The Afterschool Science Networks Study is a project of SRI Education at SRI International, an independent, nonprofit research institute conducting client-sponsored research and development. The study is the most comprehensive study to date of a statewide afterschool program. This 5-year examination of informal science is supported by the National Science Foundation under Grant No. 0917536.

SRI's partners in this work are the California AfterSchool Network, Joseph Ames of Ames & Associates, and Steve Fowler of FowlerHoffman, LLC. Inverness Research is evaluating the project.

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The SRI Education Afterschool Science Networks Study

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