

## **Science by Stealth**

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## **Science by Stealth**

**By Lucy N. Friedman & Jane Quinn**

### **How After-School Programs Can Nurture Young Scientists and Boost the Country's Scientific Literacy**

Science education seems destined this year to have its highest political profile since the Soviet Union launched Sputnik in 1957. That catalytic event led to passage the following year of far-reaching federal legislation designed to boost the nation's scientific literacy and enhance its production of scientists. Today, a different catalyst--the threat to U.S. competitiveness in the global economy--has prompted calls for new government action to stimulate our once-again-faltering pipeline of young scientists. (See Education Week, Jan. 25 and Feb. 8, 2006.)

Improving science achievement has already been an issue for K-12 educators. Next year, that subject will join reading and mathematics as an indicator of success under the federal No Child Left Behind Act. But with the national dialogue on scientific competitiveness heating up, both educators and policymakers should consider the role that time spent outside of school plays in the development of scientific curiosity and achievement. Seventy-five percent of Nobel Prize winners in the sciences report that their passion for science was first sparked in nonschool environments.

After-school programs offer an ideal setting for nurturing the potential scientist in every student, as well as for reinforcing the science taught during school hours. Compared to the school day, these programs' smaller groups, longer time slots, and less-formal settings provide opportunities for young people to visit museums, study neighborhood environments, cultivate gardens, perform laboratory experiments, and have their love of discovery awakened in countless other ways.

An influential 2004 study, "Confronting the Big Lie: The Need to Reframe Expectations of Afterschool Programs," by Robert Halpern, says it best: "Afterschool programs can respond to children's interests and concerns, giving [them] a measure of control, ... putting children in active roles as learners. ... Afterschool programs have the flexibility to provide developmental experiences in a range of domains that schools lack time for, and that low- and moderate-income families may lack resources to purchase."

While after-school education is hardly a new concept, the notion that high-quality, comprehensive enrichment opportunities should be universally available and publicly supported is a relatively recent aspiration. In the past, family income determined the level of access to after-school opportunities. Children from low-income families were typically left to their own devices, to care for younger siblings or participate in programs with limited offerings, such as remediation or recreation. Youths from affluent communities were more likely to spend their after-school time attending dance, college-prep, or photography classes.

Recognition of this disparity and its effects on the nation's widening achievement gaps, combined with the increasing number of families in which both parents work outside the home, provided impetus for a new movement advocating publicly funded, high-quality after-school opportunities for all children. That movement has been spurred by the explosive growth in the amount of information children are required to master--in schools whose calendar remains virtually unchanged since the 19th century. Not surprisingly, educators have become more interested in using after-school time to deliver, or at least reinforce, elements of the academic curriculum. Ironically, the time allocated to the sciences, which contributed significantly to this knowledge explosion, has declined in many schools, in favor of greater focus on literacy and numeracy.

As the after-school movement matures, practitioners and funders are paying more attention to program quality, participation, and access. Several useful consensus documents have been produced by national and local groups, including "Moving Towards Success: Framework for After-School Programs," funded by the Charles Stewart Mott Foundation, and the Quality Self-Assessment Tool, developed by the New York State Afterschool Network. Resources such as these draw upon a decade of work by leaders in the field, such as the National Institute on Out-of-School Time, the National AfterSchool Association, the Afterschool Alliance, and others.

Research has consistently confirmed the obvious. As the Harvard Family Research Project reported in 2004, "Higher levels of attendance in [out-of-school-time] programs have been significantly correlated to scholastic achievement, higher school attendance, more time spent on homework and on positive extracurricular activities, enjoyment and effort in school, and better teacher reports of student behavior." But despite these findings, many programs have neither expected nor achieved high attendance rates. The picture is beginning to change, however, as both programs and policies are being redesigned to encourage more regular attendance. In New York City, for example, funding for out-of-school-time programs is now tied to their participation rates. And the programs themselves are employing strategies shown to increase participation: providing a choice of activities, ensuring that these are engaging and hands-on, and offering group projects that help young people feel committed to their peers.

Both practitioners and policymakers are also working to ensure that low-income and minority youths are able to find high-quality, culturally relevant programming in their neighborhoods. Cities nationwide are addressing access issues by mapping the availability of existing programs and targeting resources to underserved areas.

People who have been part of after-school education's maturation--from researchers and practitioners, to funders and policymakers--have come to recognize the great potential that the nonschool hours hold for promoting young people's love of and commitment to learning. In after-school and summer programs, the narrow conception of academic achievement as something measured only by standardized tests can be expanded to include young people's experiences, perceptions, and aspirations. The uses as well as the nature of knowledge can be explored, and a lifelong commitment to self-directed learning can be forged.

After-school programs are ideal environments for young people to engage in scientific inquiry, critical thinking, team-building, and problem-solving, and to participate in project-based and experiential learning. Science learning meets the need for balance in after-school programs by integrating math and reading and making real-world connections between the theoretical and the observed. And after-school time is particularly appropriate for teaching scientific methods. Here are other reasons science learning is a perfect fit for out-of-school time:

- It offers opportunities for stealth learning. In New York City, The After-School Corporation, or TASC, has found that science activities are some of the most popular among students. At one program in the Bronx, students have taken regular trips to Edgar Allan Poe Park to study wildlife. This project-based learning experience gives participants the chance to get fresh air, exercise, think about the community they live in, keep journals, and discover wildlife they might not normally encounter or notice.
- Experimentation provides an opportunity to learn the skills crucial to the new century: teamwork and problem-solving. At another New York City program, 4th and 5th graders grow lima beans. In one cup, they plant beans and add water. In another, they may try growing the beans in common household products, such as soap, bleach, or cleaning solvent. The students then compare the plants' growth, watching the control group flourish while the experimental group withers. This process leads participants on to questions about how plants come to life, the effects of sunlight, water, and regular care, and how they themselves could be better stewards of their environment.
- Science learning in after-school and summer programs can give older youths the opportunity to mentor younger children. During a TASC summertime partnership with the American Museum of Natural History--a program that grew out of a collaboration between the museum and the National Aeronautics and Space Administration--high school students were trained to deliver a curriculum featuring lessons on New York City bird life to elementary school students. In the Science Mentoring Project, a collaboration among Educational Equity Concepts, the New York City River Project, and a school on Manhattan's Lower East Side, high school mentors led 5th graders in the school's after-school program on an urban ecology project. In both cases, each group of participants (older and younger) benefited from these mentoring relationships, while also learning science.
- Science learning prepares students for competition in the global economy and helps meet the needs of American businesses. The United States has a shortage of trained scientists, and invites thousands of workers from other countries to fill these lucrative jobs. At the same time, scientists and other leaders are expressing concern about the underrepresentation of people of color within the scientific fields. After-school programs that serve communities of color may help close this gap within the science workforce.

Integrating science into after-school programs is an eminently realistic aspiration. Many programs already are doing this successfully and have important lessons to share with others.

The following strategies seem to be working well and can be adapted widely:

- Use well-developed science-enrichment curricula. The Children's Aid Society in New York City has identified content-rich, engaging, and age-appropriate science-enrichment curricula and incorporated them into out-of-school-time programs. These are offered once or twice a week during the school year and also during the summer. The curricula include: Operation SMART (for Science, Math, and Relevant Technology), from Girls Incorporated; Dragonfly Quest, from Boys & Girls Clubs of America; and A World in Motion, from the Society of Automotive Engineers International.

- Integrate science into other program areas. Both of our organizations--the Children's Aid Society and The After-School Corporation--actively seek to integrate science and math into ongoing programs, such as cooking classes, sports, and community service. Examples of how this works are numerous: integrating measurement and fractions into cooking; using physics and numerical calculation in sports; calculating averages from community-resident surveys; making plant science a part of community gardening projects; and highlighting environmental science in summer-camp programs.

- Partner with community science resources. Both of our groups actively partner with the American Museum of Natural History. It serves as a site for field trips, and is both a provider of staff development and a venue for student internships. The Children's Aid Society also has joined with Bette Midler's New York Restoration Project, which is redeveloping park space and community gardens around the city. These programs allow urban youths to learn about physical environments and apply science concepts while also contributing to community revitalization.

The potential for the after-school and science fields to flourish together can be enhanced by strategic alliances. Groups such as the Coalition for Science After School, which includes leaders in both science education and after-school programming, are meeting regularly to develop ways to make science a more central part of efforts to fill students' nonschool hours productively.

At a time when dozens of funding-equity lawsuits nationwide are demanding more enrichment opportunities for poor children, when national leaders are seeking ways to enhance our economic competitiveness, and when achievement in science is poised to become a marker of public schools' success, infusing science learning into programs that exist outside of traditional school time makes good sense. In doing so, we will not only be building our base of knowledge, but also leveling the playing field for all children. n

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